FRECK RADIO & SUPPLY
38 BILTMORE AVE.
ASHEVILLE, N. C. 2880

HXL-ONE
LINEAR AMPLIFIER

TECHNICAL
DESCRIPTION
AND
OPERATING
INSTRUCTIONS

Established 1910

HAMMARLUND
Hammarlund Manufacturing Company, Inc.
A Giannini Scientific Corporation
Mars Hill, Madison County, North Carolina

52791-1

HXL-ONE
LINEAR AMPLIFIER

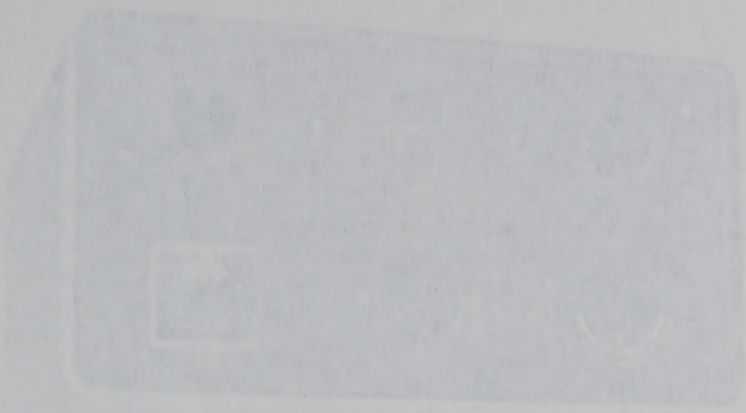
Covering the 10, 15, 20, 40 and 75/80 meter Amateur Bands rated at 1 Kilowatt DC input for CW operation, 1.5 Kw PEP SSB input, and 500 Watts DC input on conventional AM or 600 Watts DC input on Controlled Carrier AM and RTTY.

INSTRUCTION MANUAL

ESTABLISHED 1910

Type HXL–ONE Linear Amplifier

THE HAMMARLUND MANUFACTURING COMPANY
A Giannini Scientific Corporation
Mars Hill, Madison County, North Carolina



INTRODUCTION

The Hammarlund type HXL-ONE Linear Amplifier is a ruggedly built high performance amplifier designed to match the Hammarlund HX-50 Transmitter. However, it may be used with other transmitters/ exciters or transceivers of similar power rating.

The HXL-ONE Linear Amplifier is of the "grounded grid" type and is completely self-contained. It employs a pair of type 572A/B United Electronics Zero Bias Carbon Plate Triodes. The 572A/B tube has a plate dissipation rating of approximately three 811's and, therefore, a pair may be compared to six 811A's in parallel. The 572B tube, used in the later models of the amplifier, is an improved version of the type 572A. Both tubes carry substantially the same ratings. However, the 572B is somewhat easier to drive in grounded grid service.

The HXL-ONE contains its own high voltage supply, standby bias, control circuitry and metering arrangements. The control circuitry has been designed to allow the exciter unit to drive the antenna directly when the HXL-ONE switch is in the OFF position. Turning the power switch ON results in instantaneous boosted power whenever the exciter is in the "transmit" mode, whether it be by manual (MOX) voice or (VOX) operation.

TYPE 572A AND 572B VACUUM TUBES

General Characteristics

Electrical	
Filament: Bonded Thoria	
Voltage	6.3 Volts
Current	4.0 Amperes
Amplification Factor	
572A	170
572B	200
Direct Interelectrode Capacitances	
Grid Plate	6 uuf
Grid Filament	5.9 uuf
Plate Filament	0.8 uuf
Mechanical	
Base Medium Shell Small 4-Pin (A4-10)	
Length	6.50 max.
Diameter	2.063 max.
Cap	C1-5

Linear RF Power Amplifier - Class B

Maximum Ratings*

	572A		572B	
	CCS	ICAS	CCS	ICAS
DC Plate Voltage	2500	2500	2500	2500 V
DC Plate Current	200	310	225	350 Ma
DC Grid Current	50	65	60	75 Ma
DC Plate Input	425	575	500	650 W
Plate Dissipation	140	190	160	220 W
Grid Dissipation	18	18	20	20 W

*Tentative

TECHNICAL SPECIFICATIONS

Frequency Range	10, 15, 20, 40 and 75/80 Meter Amateur Bands
Type of Circuitry	Grounded Grid Employing Two Type
	572 A/B Carbon Plate High-Mu Triodes
Plate Power Input	1 KW DC for CW Operation
	1.5 KW PEP for SSB
	500 watts DC for AM
	600 watts DC for Controlled Carrier AM or RTTY
Power Gain	10 DB
RF Input Impedance	50 ohms, Nominal
RF Output Impedance	50 ohms
Power Requirements	Standby-100 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
	Transmit-1500 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
Size	17" wide, ~~9-1/2"~~ 14" deep, 9-1/8" high
Weight	66 lbs.

TUBE & SEMI-CONDUCTOR COMPLEMENT

2 572A/B Vacuum Tubes

2 1N34A Diodes

1 CER69A Diode

6 CER73 Diodes

UNPACKING AND INSTALLATION

Unpacking

After unpacking the HXL-ONE Linear Amplifier, examine it closely for any possible damage which may have occured during transit. The tubes are shipped separately to insure that they do not become damaged. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for any special instructions before removing or destroying them.

CAUTION

The high voltage of the HXL-ONE Amplifier is approximately 2000 volts. Therefore, extreme caution should be exercized at all times. The unit should not be powered unless its cabinet is firmly installed and the chassis of the amplifier is connected to a good ground.

Tubes

To install the tubes, it is necessary to remove the enclosure from the amplifier. This is accomplished by removing the hex head screws at the rear of the cabinet and withdrawing the panel and chassis. BEFORE TOUCHING ANY HIGH VOLTAGE CIRCUITRY IT IS SUGGESTED THAT THE PLATE CAPS FOR THE TUBES BE GROUNDED WITH A SCREWDRIVER WHICH HAS A WELL INSULATED HANDLE JUST TO MAKE SURE THAT THE HIGH VOLTAGE FILTER CAPACITORS ARE NOT HOLDING A CHARGE. The tubes should then be carefully inserted in their sockets and the plate caps clamped into place. Either 572A or 572B tubes may be employed. It is important to note, however, it is necessary to use identical types for proper operation, that is, two 572A's or two 572B's. Failure to do this will result in one tube handling more than its share of the load. After inserting the tubes, the cabinet should be put back on the unit before any attempt is made to apply power.

Note: If a soft rubber mat or padding material is used and the panel of the amplifier is placed face down on same, it will be found that the enclosure is more easily installed.

Power Source Requirements

The HXL-ONE is designed to be operated from a standard 110/120 volt, 50/60 cycle AC supply or, by making internal changes, from a 220/230 volt, 50/60 cycle AC supply. Due to the power requirements of this equipment, it should be definitely ascertained that the source is capable of supplying 15 amperes of AC power for 110/120 volt operation or 7.5 amperes for 220/230 volt operation.

As normally shipped from the factory, the amplifier is wired to be plugged into a standard 110/120 volt receptacle. For 220/230 volt operation it will be necessary to remove the unit from the case and reconnect the filament and plate power transformer primaries as called for on the schematic. Do not change the wiring of the fan motor. The motor is designed to operate from a 115 volt source only. With the primaries of the filament transformer wired for 230 volts, each one will have a drop of 115 Volts across it. The power to operate the fan motor is negligible, and the unbalance between the windings due to the motor load across one of them may be disregarded. In addition, for 220/230 volt operation, the power plug should be changed to the type used at the particular location and the third lead which is ground should be firmly connected to the chassis of the HXL-ONE before power is applied to the unit. Also, when changing from 110 to 220 volts (or vise versa) be sure to install the proper fuses. The fuse values are shown on Fig. 1.

Connection to Antenna and Exciter Unit

The HXL-ONE should be located reasonably close to the exciter unit. In a typical all Hammarlund station, the receiver is normally placed in the center with the exciter to the right or left hand side as convenient to the individual operator with the HXL-ONE Linear Amplifier on the other side. The antenna that formerly went to the exciter should now go to the RF OUTPUT of the HXL-ONE Linear Amplifier (See Fig. 1). For exciters having a built-in antenna relay, such as the HX-50, a short length of coaxial cable should be used to connect the output of the exciter to the input of the linear amplifier. In those installations where a separate antenna relay is used, the HXL-ONE Linear Amplifier should be connected between the transmit terminal of the antenna relay and the exciter unit. With this mode of operation the receiver associated with the exciter should be wired for blocking bias muting.

Note: If this muting feature is not available in the exciter, refer to the Instruction Manual of the appropriate equipment to determine what receiver muting circuitry should be employed when the exciter is used with a linear amplifier.

Figure 1 shows a view of the rear of the HXL-ONE chassis and indicates the connections from the unit to the exciter and the control contacts. The control connections from various exciters are indicated in Table 1. When making connections to transmitters other than type HX-50, it may be necessary to observe polarity with respect to ground. Terminal 2 of terminal board TB 101 of the HXL-ONE (marked RELAY on Fig. 1) is grounded, and in some transmitter exciters, the spare

contacts may have the common or swinger arm of the relay grounded. In this instance it will be necessary to observe proper polarity of connection (ground to ground, and hot to hot).

TABLE 1

RELAY CONNECTIONS FOR VARIOUS EXCITERS

TO HXL-ONE

Connect Relay of HXL-ONE to:

Exciter	Jack or Other	Terminal
HX-50	TB-101	8 and 7
HX-500	J-11	3 and 2
KWM-1	J-5	20 and 10
KWM-2	J-3	Ant. Relay and GND
32-S	Phono Jack	Ant. Relay and GND
TR-3	J-3	8 and 5
HT-32	SO-8	6 and 12 or 2 and 3
NCX-3	Ext. Relay	1 and 2
SW-240	Aux. Relay	T and C
Galaxy	J4	Phone Jack
SR-150	J7	10 and 11
SR-160	J7	10 and 11

Note: Be sure to connect the Ground Terminal (#2) of the HXL-ONE to the Ground Terminal of the EXCITER.

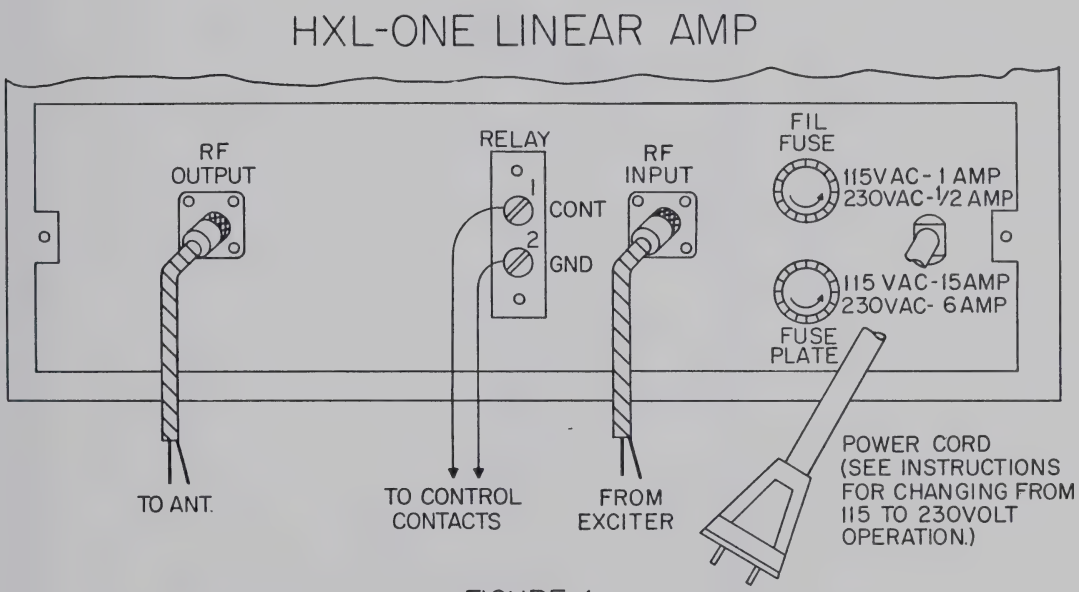


FIGURE 1

HXL-ONE CONNECTION POINTS AT REAR OF CHASSIS

Fig. 2 shows a typical arrangement for connecting the HXL-ONE to the HX-50 Transmitter. In this case the control contacts of the HXL-one may be connected indiscriminately to terminals 7 and 8 of TB101 of the HX-50 Transmitter since neither of the latter terminals is grounded.

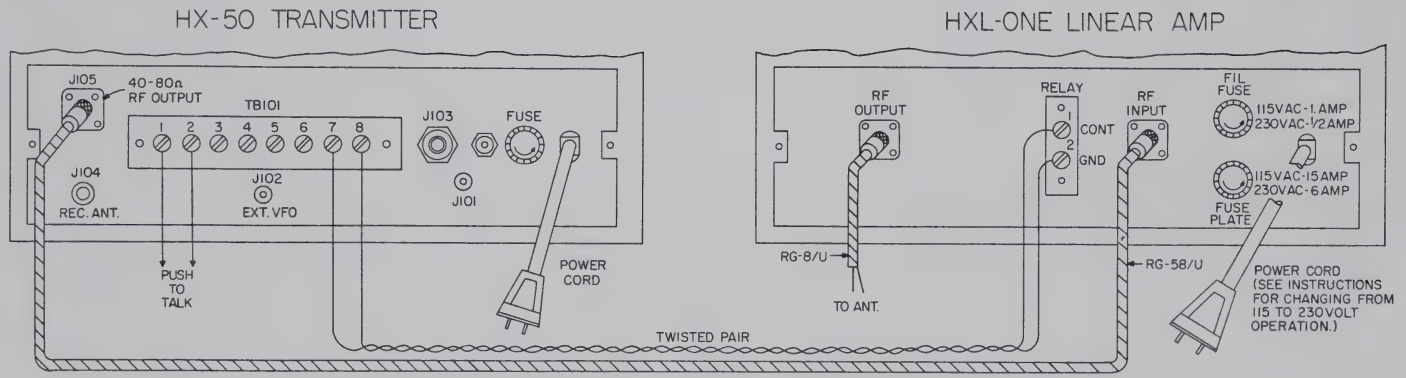


FIGURE 2

TYPICAL STATION CONTROL
HX-50 & HXL-ONE

OPERATION AND TUNE UP

Front Panel Controls and Meter Functions

Operating and tuning the HXL-ONE is accomplished entirely from the front panel. The various controls and meter functions are outlined below.

POWER ON-OFF SWITCH - This switch applies power to the primaries of the filament and plate transformers of the amplifier.

BAND - This control is used to set the amplifier on the desired band.

TUNE - This control is used for tuning the amplifier plate circuit to resonance.

BALANCE - This control is only effective with the meter switch in the LIN position. It is used to set the meter to zero for checking amplifier linearity.

INCREASE LOAD - This control provides a means for adjusting the amplifier output.

METER - The reading of the meter is in accordance with the settings of this control as follows:

PL MA - indicates the plate current drawn by the tubes.

PL HV - indicates the plate voltage.

Note: Plate voltage times plate current in amperes (500 ma = 0.5 amperes) equals DC plate power input. The relationship between the SSB suppressed carrier peak power and CW or single tone operation is roughly two times. This applies to the condition where limiting or suppressing devices are not used in the circuitry of the audio or RF sections of the transmitter/exciter.

RF VOLTS - indicates relative output voltage appearing across the output terminal of the unit.

LIN - compares the change in input signal to the change in output signal for checking linearity of the amplifier. It does not check the linearity of the exciter unit, nor does it indicate flat-topping.

Tune-up-Procedure

(1) With the HXL-ONE Linear Amplifier power switch in the OFF position, tune the exciter unit to its normal power output.

CAUTION: A dummy load (such as the Heath Cantenna) should be used while tuning up any transmitter. This is especially true of a high power linear amplifier and is extremely important, particularly during the time when the operator is becomming familiar with the operation of the new piece of equipment. ALWAYS TUNE UP INTO A DUMMY ANTENNA SO AS TO MINIMIZE INTERFERENCE ON THE AIR.

(2) Turn down the RF drive control on the exciter unit.

Note: If the exciter has no RF drive control or the RF drive control is ineffective on SSB, reduce the audio input to the exciter.

(3) Set the BAND control for the desired band and the TUNE control in the approximate position for the band in use.

(4) Set the LOAD control at the fully clockwise direction (minimum loading).

(5) Push the HXL-ONE Switch to ON, and apply enough RF drive from the exciter so as to produce about 250 milliamperes of plate current (Meter switch must be in PL MA position). Quickly rotate the TUNE control for a dip in plate current.

(6) Bring the RF drive control of the exciter up to the normal level and check the TUNE control for maximum dip in plate current.

Note: The normal level of the drive control is that level which produces sufficient output to drive the linear amplifier at its rated power input. In most cases it will be necessary to operate with the drive control below maximum output of the exciter.

(7) Turn the HXL-ONE LOAD control in a counter-clockwise direction which will produce an increase in plate current. By continually readjusting the TUNE control for a dip in plate current as the load is increased, a position of the LOAD control should be found which produces maximum RF output. With sufficient drive the amplifier may be loaded to 500 milliamperes plate current for CW and SSB operation. For AM the loading should be 275 milliamperes. For RTTY the plate current should be 300 milliamperes.

Note: Always finish the tune-up process by checking for dip with TUNE control.

For best linearity the loading of the amplifier should be increased just beyond the point of mximum power output. Proper loading of the amplifier occurs when the power output drops approximately 5% from the maximum and when the loading is on the over coupled side.

(8) Set the meter for checking the linearity of the amplifier by turning the meter switch to the LIN position. With the HXL-ONE operating in the SW mode, adjust the BALANCE control for a "0" meter reading. Under single sideband operation, the movement of the meter should remain virtually constant during modulation. Any appreciable downward deflection indicates non-linear operation and should be avoided.

THEORY OF OPERATION

General

The HXL-ONE operates as a grounded grid, Class B RF linear amplifier. In addition to the RF and meter circuitry, the power supply and an antenna changeover relay are included within a single enclosure. A schematic diagram of the amplifier is included at the rear of this manual and should be referred to in connection with the following description.

Input Circuit

A broadband input circuit which includes a tapped bifillar wound input coil L105A, couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the BAND switch S102. It automatically selects the proper tap on L105A to which the input is connected for best drive efficiency.

A sampling circuit consisting of R104, R105, C115 and CR #102 supplies a DC voltage, proportional to the applied RF from the exciter, to the metering circuit. The DC thus obtained in used to check the linearity of the amplifier as is explained in a subsequent paragraph.

Bias Circuit

The bias circuit, CR #103 and C #118 performs two functions. First, it is a source of voltage employed to operate the antenna transfer relay K101, and second, it supplies a small negative DC voltage to the grids of the 572A/B tubes during standby. Although the tubes are high mu zero bias triodes, the application of a small bias reduces the standby plate current to a very low value and eliminates the "shot noise" generated by the electron flow of the amplifier from getting into the associated receiver.

Output Circuit

The plate or output circuit is tuned by a Pi network consisting of C106, L103, L104 and C109. In addition C107 and C108 are automatically switched in on the lower frequency bands. Variable capacitor C106 resonates the plate tank circuit and is adjusted by operating the TUNE control on the front panel. The three-gang capacitor C109 is varied by operating the LOAD control. Its function is to attain a match between the output of the amplifier and the impedance presented by the antenna load and its feed system. To attain the best efficiency of operation, the VSWR of the antenna system should be no greater than 2:1.

A sampling circuit R107, R108, C110, CR101 and R109 assicoated with the amplifier output has two functions. When the meter switch is in the RF VOLTS position, a portion of the RF at the output termination is rectified and indicates the RF voltage at the output of the amplifier. The voltage as indicated, however, is only approximate to within 20% and will vary with frequency. If the impedance at this point is known the power output may be calculated roughly by using the formula E^2/R where E is the indicated voltage and R is the impedance.

Linearity Circuit

The second function of the output sampling circuit is to check the linearity of the amplifier. It is not designed to replace the more elaborate and preferred means of checking linearity with an oscilloscope or similar type modulation checker which employs oscilloscope techniques. An instrument such as the Heath Monitor Scope is highly recommended as a permanent station accessory.

With the meter switch in the LIN position, the voltage from the input circuit is balanced by an equal voltage from the output circuit. A balance between the two is attained by means of variable resistor R121 marked BALANCE. As long as the ratio of the two voltages remains constant the meter indication will be zero. However, if by increasing the input power there is no longer an increase of output power the meter will be caused to swing away from zero, indicating that saturation has been reached. During modulation a slight wiggle of the meter may be noted. This is normal and is due to a slight non-linearity of the tube characteristics. Violent swings of the meter should be avoided. It must be pointed out that the linearity circuit will not indicate flat-topping of the exciter.

Antenna Relay

The double pole-double throw antenna relay is wired to permit the antenna to bypass the amplifier during periods that the amplifier is OFF or during periods that the relay is not actuated by an external device.

Power Supply

Both the filament and plate transformers have dual primaries which are connected in parallel for 115 Volt operation and in series for 230 Volt operation. The plate supply employs a voltage doubler circuit in which CR104 thru CR109 are silicon rectifiers and C123 thru C128 are the filter capacitors. To eliminate the current drawn by the bleeder from the metering circuit, the bleeder resistor R119 is not directly connected to ground.

The plate milliamperes drawn by the tubes is a function of the current thru a one ohm resistor R118. When the tubes draw 500 milliamperes, 1/2 volt appears across the resistor and the meter multiplier resistor R120 in conjunction with internal resistance of the meter acts as a voltmeter but is calibrated in milliamperes.

MAINTENANCE

General

The HXL-ONE Linear Amplifier is designed to give years of trouble free service. Under normal conditions, it requires little attention. Because the equipment is ventilated by a fan, dust may accumulate on the switches and other components within the enclosure. It is suggested, therefore, that the unit be removed from the cabinet and cleaned approximately every six months or oftener if it is located in a dusty area. The preferred method of cleaning is to use a vacuum cleaner while dusting with a clean brush.

While the unit is out of the cabinet, inspect the relay contacts for burning or pitting. To clean the contacts, use a burnishing tool or the finest grit sandpaper. Do not use emery cloth or "crocus" cloth. After burnishing or sandpapering, clean thoroughly with alcohol, carbon tetrachloride or other cleaning agent.

Twice a year, a drop or two of light oil should be applied to the bearings of the fan motor.

Neutralizing

To check neutralization, tune up the amplifier on the 10 meter band with the amplifier connected to a dummy load such as the Heath Cantenna to which a VTVM can be attached. Turn the TUNE control back and forth through resonance and note that the maximum output power occurs at the plate current dip. If necessary readjust the neutralizing capacitor C105.

BEFORE MAKING ADJUSTMENTS OF THE NEUTRALIZING CAPACITOR TURN OFF THE POWER TO THE AMPLIFIER.

RF Output Metering Circuit Adjustment

Capacitor C110 in the RF output metering circuit is used to equalize the meter readings over a relatively wide frequency range. This adjustment is normally set at the factory, however, if it is suspected that re-adjustment is required it will be necessary to temporarily make use of a calibrated RF wattmeter. To reset C110 load the transmitter and linear amplifier into a dummy load whose calibration is relatively flat over the frequency ranges concerned. Load the amplifier for an output wattmeter reading of 400 watts in the 80 meter band. Note the meter reading with the meter selector switch in the RF Volts position. Next tune to 20 meters and reload the amplifier for 400 watts. Note the meter reading (RF VOLTS) again. Re-adjust C110 if necessary to produce the same meter reading as when the amplifier was tuned up on the 80 meter band. On the basis of a pure 50 ohm load, the voltmeter should indicate 141 volts.

Note: It is extremely important that the amplifier be loaded to the same RF power output into the dummy load in all of these tests.

Now return to the 80 meter band and notice the meter reading. If it is within 10% of the 20 meter reading make no further adjustments. If in excess of 10%, re-adjust C110 and then recheck on the 20 meter band. After two or three cycles of rechecking a setting of C110 should be found which produces the desired condition.

Bandswitch Selector

Should the cord operating the band switch selector require replacement refer to Figure 3 which shows the details of this operation.

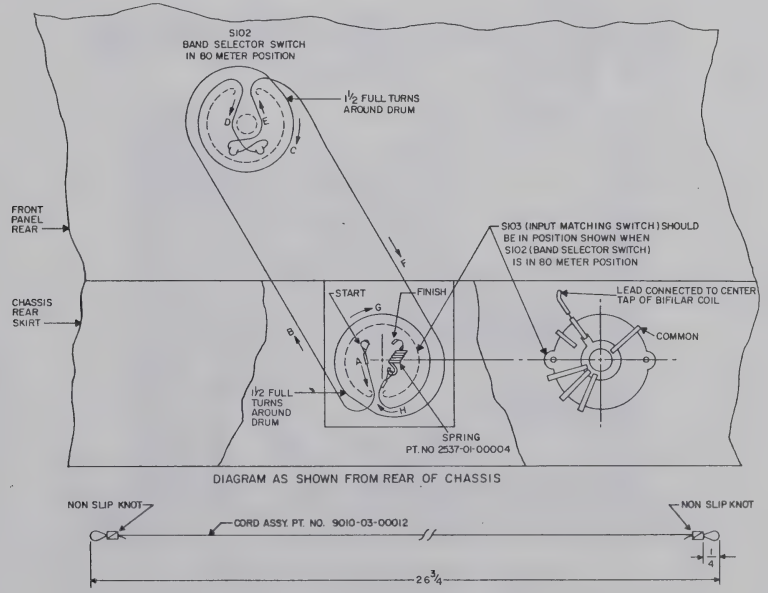


FIGURE 3

BAND SELECTOR & INPUT MATCHING SWITCH DRIVE ASSY.

Trouble Shooting

Most troubles, should they occur, can be readily located by the average amateur radio operator. Refer to the schematic drawing in the back of the manual and Figures 4 and 5 which are top and bottom views of the chassis and indicate the location of the principal components. A parts list is contained in Section 7. This gives component values and Hammarlund part numbers. Should difficulty be experienced with the equipment please write the Hammarlund Manufacturing Company for advice or to arrange for factory service.

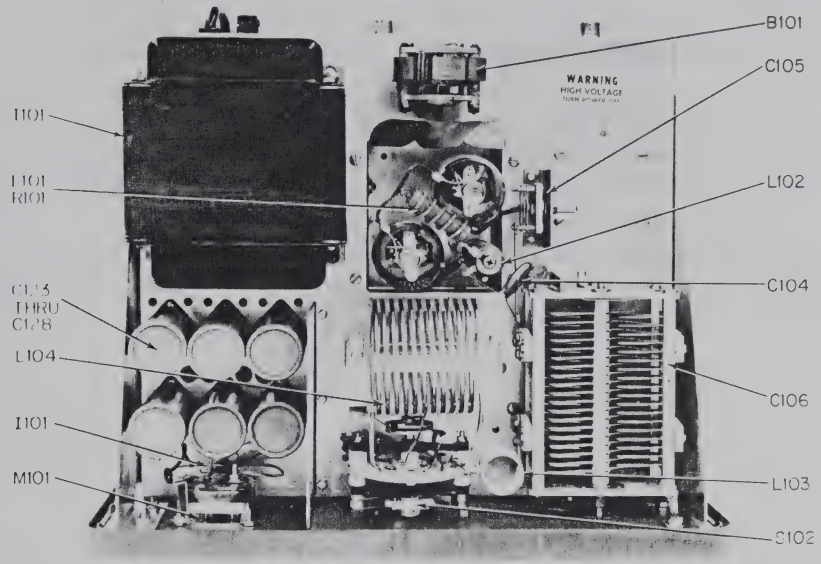


Fig. 4 – Top View of Chassis

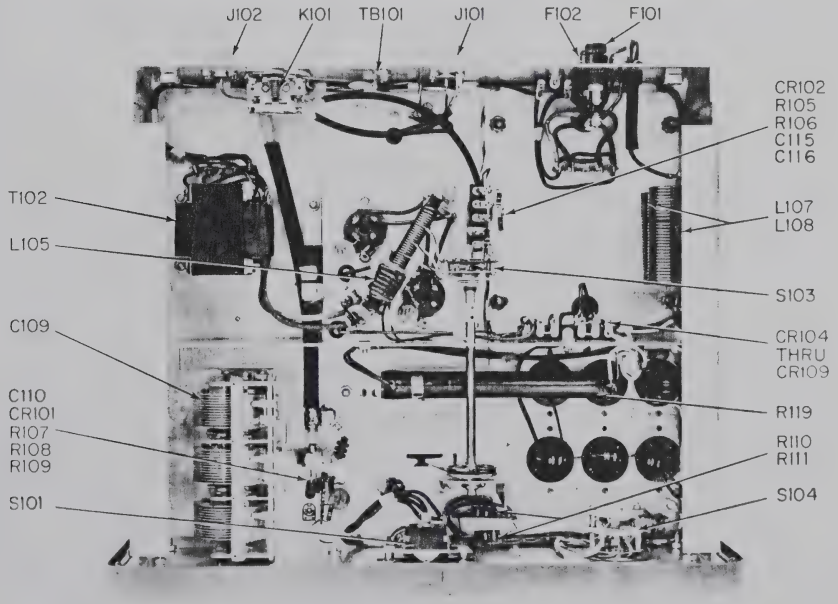


Fig. 5 – Bottom View of Chassis

SOME USEFUL NOTES & HINTS

The article entitled "How To Run Your Linear" which appeared in QST for November 1962, should be referred to for background and theory of operation of linear amplifiers.

220 Volt operation is recommended for best performance, particularly at the maximum plate power inputs, as the reduced primary amperage results in lower voltage drops in house wiring, thereby providing improved regulation of the high voltage circuitry.

It may be necessary to slightly re-tune the exciter for maximum drive to the amplifier on the various bands. When switching to straight through reduced power operation, the exciter unit should normally not require any re-tuning.

When modulating the HXL-ONE in SSB service, the plate current swing should be between 300 and 400 milliamperes on voice peaks.

On the 10 and 15 meter bands, minimum loading may not occur at the fully clockwise position of the loading control. The correct setting is counter-clockwise from that position which produces minimum loading.

Do not decrease the loading of the amplifier to reduce plate power input. The amplifier must be loaded for maximum input consistent with maximum output. The drive of the exciter should be reduced if less plate power input to the amplifier is desired. This will assure maximum linearity.

While the loading and tuning adjustments may be used to reduce a small impedance difference between the amplifier and the antenna system, it is highly desirably to have the standing wave ratio of the antenna system as low as possible to provide best performance. With an appreciable SWR the tuning indications will vary widely from those marked on the front panel.

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	MOTOR	
B101	Motor, 115 V-60 Cycles, AC	3510-02-00002
	CAPACITORS	
C101, C102, C113	Fixed, Ceramic disk, .005 mfd ± 20%, 500 V	1509-01-01020
C103, C104	Fixed, Ceramic disk, .0022 mfd, ± 20%, 6000V	1509-02-01034
C105	Variable, Neutralizing, 2-10 mmf	9411-03-31108
C106	Variable, Tuning Included in L103	9412-90-11030
C107, C108	Fixed, Mica, 820 mmf ± 10%, 500V	1519-02-02002
C109	Variable, Loading	9010-03-00005
C110	Trimmer, N750, 8–50 mmf, 350V	1513-01-00002
C111, C112, C116, C117, C119, C120, C121, C122	Fixed Ceramic disk, .01 mfd GMV, 500V	1509-02-01033
C114	Fixed Ceramic disk, .1 mfd +80-20%, 100V	1509-01-01018
C115	Fixed, Dur Mica DM-15 4 mmf ± 5 mmf 500V	1519-02-00025
C118	Electrolytic 250 mfd 25V	1515-02-01008
C123, C124, C125, C126, C127, C128	Electrolytic 100 mfd 450V	1515-01-00001
	DIODES	
CR101, CR102	Germanium Diode 1N34A (RF Indicator)	4823-02-00001
CR103	Silicon Diode CER69A (Bias & Relay)	4804-02-00002
CR104, CR105, CR106, CR107, CR108, CR109	Silicon Diode CER73 (High Voltage)	4808-02-00002

7. PARTS LIST - HXL-ONE

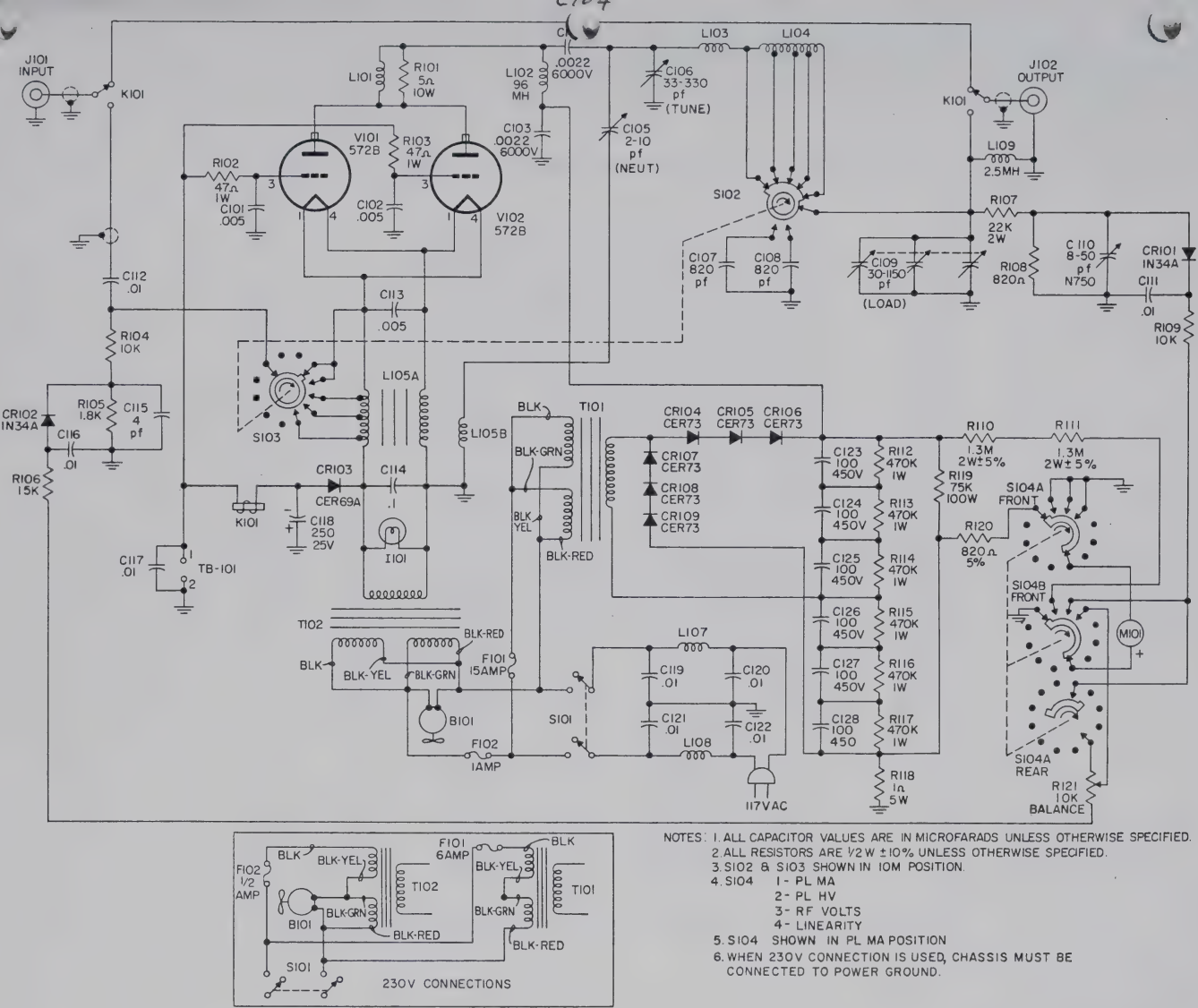
SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	FUSES	
F101	Fuse, ABC, 15 Amp. for 115V operation (plate)	5134-02-00206
F102	Fuse, SLO-BLO, 3AG, 1 Amp. for 115 V operation	5134-02-00002
F101	Fuse, ABC, 6 Amp. for 230V operation (plate)	5134-02-00207
F102	Fuse, SLO-BLO, 3AG, 1/2 Amp. for 115V operation	5134-02-00006
	LAMP	
I 101	Lamp Incandescent #47	3901-01-00001
	CONNECTORS	
J101	Connector, RF Input Receptacle	2111-01-00001
J102	Connector, RF Output Receptacle	2111-01-00001
	RELAY	
K101	Relay, Antenna	4531-02-00001
	COILS	
L101	Parasitic RF Inductor Assembly (with plate caps)	9010-03-00011
L102	RF Choke, 96 Millihenries	1804-02-00053
L103	Inductance Coil, Included in C106	See C106
L104	Inductor, PA Plate Tank	1805-02-00060
L105	Coil Assembly. Includes L105A and L105B	9010-03-00002
L105A	Coil, Bifilar Included in L105	See L105
L105B	Coil, Neutralizing Included in L105	See L105
L107	RF Choke	1805-02-00120
L108	RF Choke	1805-02-00120
L109	RF Choke, 2.5 Millihenries	1802-01-00001

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	METER	
M101	Meter (Special)	2902-02-00001
	RESISTORS	
R101	5 ohms, 10W., ± 10%	See L101
R102, R103	47 ohms, 1W., ± 10%	4704-01-00616
R104	10K, 1/2W., ± 10%	4703-01-00344
R105	18K, 1/2W., ± 10%	4703-01-00335
R106	15K, 1/2W., ± 10%	4703-01-00346
R107	22K, 2W., ± 10%	4705-01-00948
R108	820 ohms, 1/2W., ± 10%	4703-01-00331
R109	10K, 1/2W., ± 10%	4703-01-00344
R110, R111	1.3 megohms, 2W., ± 5%	4705-02-01122
R112, R113, R114, R115, R116, R117	470K, 1W., ± 10%	4704-01-00664
R118	1 ohm, 5W., ± 10%	4713-01-00002
R119	75K, 100W., Wirewound	4715-02-00101
R120	820 ohm, 1/2W., ± 5%	4703-02-00445
R121	Variable, 10K, ± 30%, Balance	4735-02-01013
	SWITCHES	
S101	Switch, Power	5111-02-00001
S102	Switch, 5 Pos., Band Selector	5106-02-00004
S103	Switch, RF Input Matching	5106-02-00002
S104	Switch, 4 Pos., Meter Function	5107-02-00005
	TRANSFORMERS	
T101	Power Transformer	5601-02-00001
T103	Filament Transformer	5602-02-00001
	VACUUM TUBES	
V101, V102	Electron, 572A/B	5731-02-00001

MISCELLANEOUS PARTS

DESCRIPTION	PART NO.
Fan	2604-02-00002
Knob 2" Diameter (Tune & Band)	2430-02-00087
Knob 3/4" Diameter (Balance)	2430-01-00082
Knob 1-1/2" Diameter (Meter & Load)	2430-02-00085
Spring (String Drive, Band Selector)	2537-01-00004
Band Selector Drive Cord Assembly	9010-03-00012
Mounting Screws, Steel (Cabinet to Chassis)	2838-54-10120
Washer, flat steel (Cabinet to Chassis)	2898-64-11005
Fuse Holder and Cap	5136-01-00001
Instruction Book	52791-1



NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE ½W ±10% UNLESS OTHERWISE SPECIFIED.
3. S102 & S103 SHOWN IN 10M POSITION.
4. S104 1- PL MA
   2- PL HV
   3- RF VOLTS
   4- LINEARITY
5. S104 SHOWN IN PL MA POSITION
6. WHEN 230V CONNECTION IS USED, CHASSIS MUST BE CONNECTED TO POWER GROUND.

SCHEMATIC DIAGRAM
Linear Amplifier (HXL-ONE)

THE HAMMARLUND MANUFACTURING COMPANY, INC.

Standard Warranty

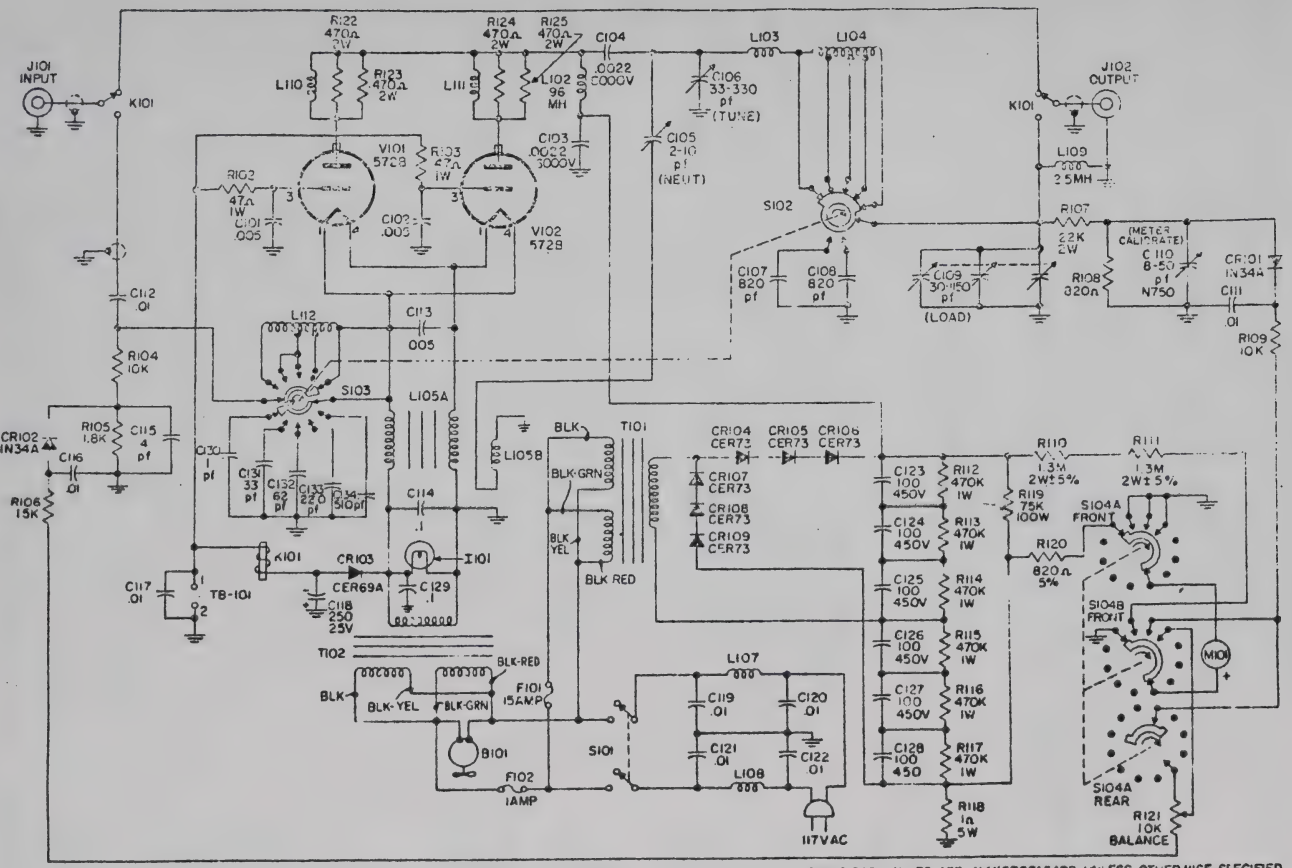
The Hammarlund Manufacturing Company, Inc., warrants this equipment to be free from defects in workmanship and materials under normal and proper use and service for the uses and purposes for which it is designed, and agrees to repair or replace, without charge, all parts thereof showing such defects which are returned for inspection to the Company's factory, transportation prepaid, within a period of 90 days from date of delivery, provided such inspection discloses to the satisfaction of the Company that the defects are as claimed, and provided also, that the equipment has not been altered, repaired, subjected to misuse, negligence or accident, or damaged by lightning, excessive current or otherwise, or had its serial number or any part thereof altered, defaced, or removed. Tubes shall be deemed to be covered by the manufacturer's standard warranty applicable thereto, and such items shall be and are hereby excluded from the provisions of this warranty. Pilot lamps and fuses are not guaranteed for length of service.

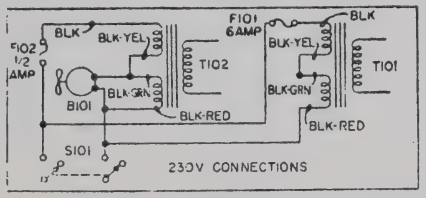
Except as herein specifically provided, no warranty, express or implied, other than that of title, shall apply to any equipment sold hereunder. In no event shall the Company be liable for damages by reason of the failure of the equipment to function properly or for any consequential damages.

This Warranty is valid for the original owner of the equipment, and is contingent upon receipt of the Warranty Registration Card by the Company. No equipment shall be returned to the factory for repairs under warranty unless written authorization is obtained by the Company, and the equipment is shipped prepaid by the owner. The Company maintains Authorized Service Stations, names and locations of which will be sent upon request of the owner.

Hammarlund Manufacturing Company, Inc.
Mars Hill, Madison County, North Carolina

ESTABLISHED 1910





NOTES
1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS ARE 1/2 W ±10% UNLESS OTHERWISE SPECIFIED
3. S102 & S103 SHOWN IN 10M POSITION
4. S104 1- PL MA
2- PL HV
3- RF VOLTS
4- LINEARITY
5. S104 SHOWN IN PL MA POSITION
6. WHEN 230V CONNECTION IS USED, CHASSIS SHALL BE CONNECTED TO POWER GROUND.

NEW SCHEMATIC DIAGRAM
LINEAR AMPLIFIER (HXL-ONE)

ADDENDUM
TO
TECHNICAL DESCRIPTION AND OPERATING INSTRUCTION MANUAL NUMBER 52791-1
HXL-ONE LINEAR AMPLIFIER

THEORY OF OPERATION

Page 7 (Input Circuit)

Change 1st paragraph to read as follows:

A broadband input circuit which includes a tapped coil L112, couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the band switch S102. It automatically selects the proper tap on L112 to which the input is connected for best drive efficiency.

CHANGES TO PARTS LIST

Page 11	Hammarlund Part No.
1. Add capacitor C129 Disc-ceramic, .1 mfd +80-20%	1509-01-01018
2. Add capacitor C130 Dur-mica DM-15, 1 pf ±.5 pf, 500V	1519-01-00022
3. Add capacitor C131 Dur-mica DM-15, 33 pf ±2%, 500V	1519-01-00086
4. Add capacitor C132 Dur-mica DM-15, 62 pf ±2%, 500V	1519-01-00056
5. Add capacitor C133 Dur-mica DM-15, 220 pf ±5%, 300V	1519-01-00007
6. Add capacitor C134 Dur-mica DM-19, 510 pf ±5%, 500V	1519-01-03002

Page 12

1. Delete coil L101 Parasitic RF Inductor Assembly (with plate caps)	9010-03-00011
2. Add coil L110, Choke Parasitic	1806-02-00040
3. Add coil L111, Choke Parasitic	1806-02-00040
4. Add coil L112, Input Matching	1804-02-00061

Page 13

1. Delete resistor R101, 5 Ω, ±10%, 10W.	
2. Add resistor R122 470 Ω ±10%, 2W.	4705-01-00928
3. Add resistor R123 470 Ω ±10%, 2W.	4705-01-00928
4. Add resistor R124 470 Ω ±10%, 2W.	4705-01-00928
5. Add resistor R125 470 Ω ±10%, 2W.	4705-01-00928
6. Change switch S103 from 5106-02-00002 to ----------	5106-02-00021

Page 14

1. Add Clip, Tube cap	2117-02-00002

NOTE: Disregard Schematic Diagram in present manual, use new Schematic furnished with this Addendum.

Addendum No. 9010-15-00001

These 2
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1 OTHER ONE
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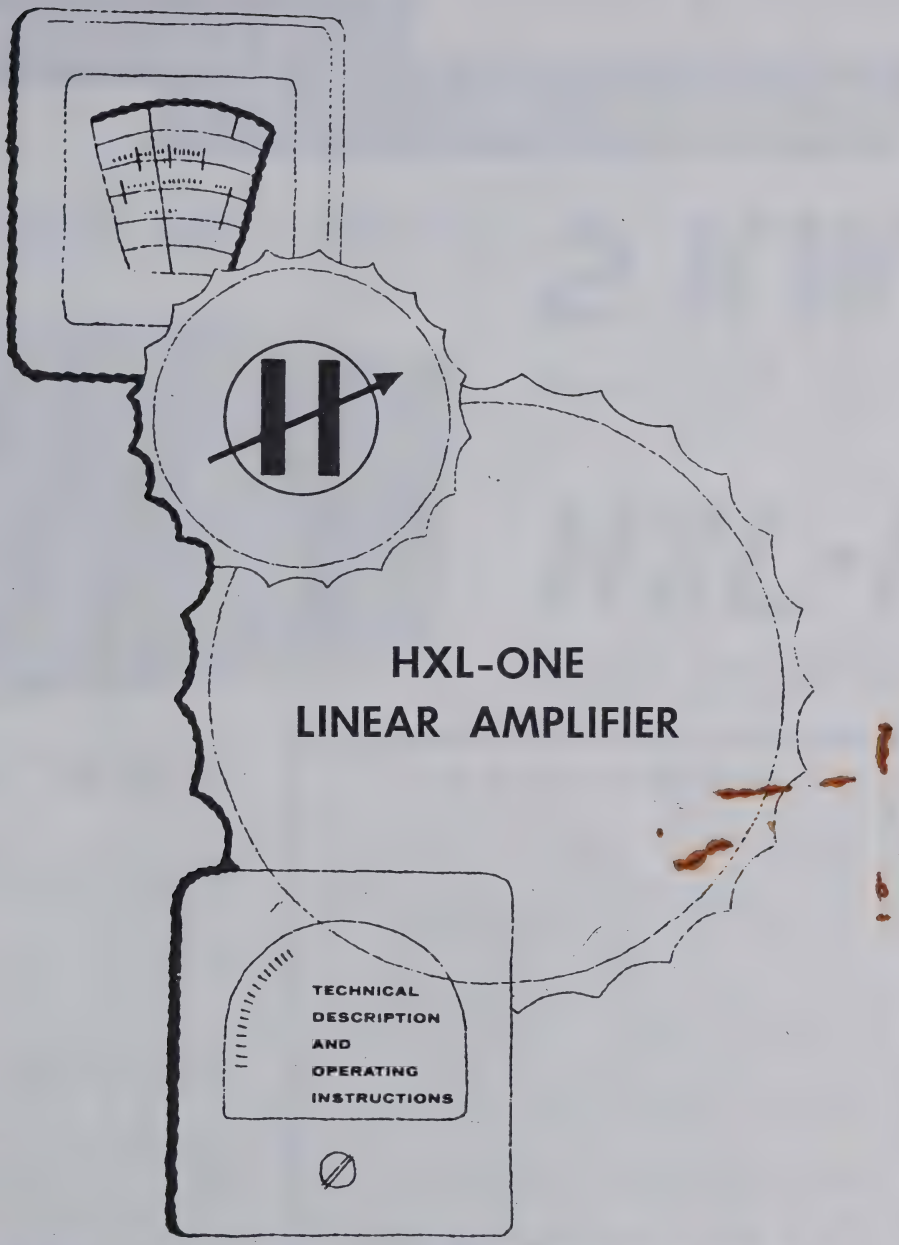
HAS FRICK'S
STAMP ON IT



HXL-ONE
LINEAR AMPLIFIER

TECHNICAL
DESCRIPTION
AND
OPERATING
INSTRUCTIONS

HAMMARLUND

Established 1910

Hammarlund Manufacturing Company, Inc.

A Giannini Scientific Corporation

Mars Hill, Madison County, North Carolina

52791-1

HAMMARLUND DESK TOP LINEAR

the smallest self-contained

2 KW

PEAK POWER INPUT

$469.95

HXL-1

linear amplifier

Hammarlund tradition demands quality one notch better than the rest!

So—you get . . .

. . . rugged, widespaced, industrial type tuning capacitors made by the most famous name in capacitors—Hammarlund!

. . . rigidly mounted "Hi Q," low loss tank coil for maximum power output!

. . . oversize power transformer specially designed to handle "peak power" requirements!

. . . no RF watt meter needed for proper tune up. RF output scale and linearity test provide all you need for tuning up your linear! Shows improper loading and overdrive!

. . . Pi-network output circuit for efficient power transfer to your antenna!

. . . high efficiency blower keeps final tubes cool for long operating life.

FEATURES

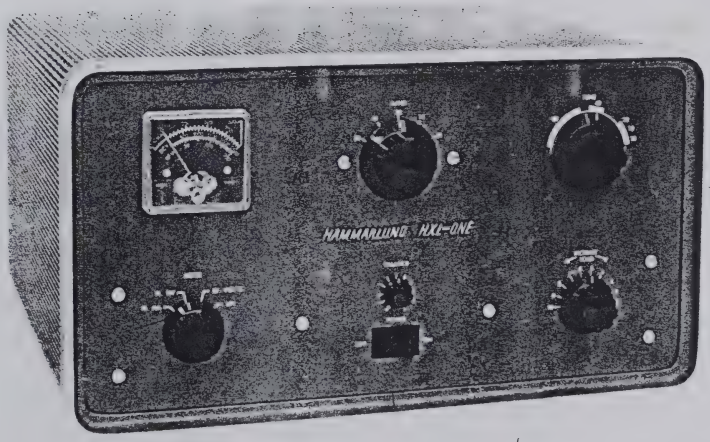
- Complete 80 through 10 meter coverage!
- Compatible with HX-50A or any 70-100 watt exciter!
- "Wide-band" grounded grid input circuit!
- "Instant power"—no warm up needed!
- Built in DC operated antenna relay for chatter-free operation.
- Circuits monitored by multi purpose meter.
- Solid state, long life power supply.
- Control circuitry compatible with most exciters.

HXL-ONE
LINEAR AMPLIFIER

Covering the 10, 15, 20, 40 and 75/80 meter Amateur Bands rated at 1 Kilowatt DC input for CW operation, 1.5 Kw PEP SSB input, and 500 Watts DC input on conventional AM or 600 Watts DC input on Controlled Carrier AM and RTTY.

INSTRUCTION MANUAL

ESTABLISHED 1910



Type HXL–ONE Linear Amplifier

THE HAMMARLUND MANUFACTURING COMPANY
A Giannini Scientific Corporation
Mars Hill, Madison County, North Carolina

INTRODUCTION

The Hammarlund type HXL-ONE Linear Amplifier is a ruggedly built high performance amplifier designed to match the Hammarlund HX-50 Transmitter. However, it may be used with other transmitters/exciters or transceivers of similar power rating. ☆

The HXL-ONE Linear Amplifier is of the "grounded grid" type and is completely self-contained. It employs a pair of type 572A/B United Electronics Zero Bias Carbon Plate Triodes. The 572A/B tube has a plate dissipation rating of approximately three 811's and, therefore, a pair may be compared to six 811A's in parallel. The 572B tube, used in the later models of the amplifier, is an improved version of the type 572A. Both tubes carry substantially the same ratings. However, the 572B is somewhat easier to drive in grounded grid service.

The HXL-ONE contains its own high voltage supply, standby bias, control circuitry and metering arrangements. The control circuitry has been designed to allow the exciter unit to drive the antenna directly when the HXL-ONE switch is in the OFF position. Turning the power switch ON results in instantaneous boosted power whenever the exciter is in the "transmit" mode, whether it be by manual (MOX) voice or (VOX) operation.

TYPE 572A AND 572B VACUUM TUBES

General Characteristics

Electrical	
Filament: Bonded Thoria	
Voltage	6.3 Volts
Current	4.0 Amperes
Amplification Factor	
572A	170
572B	200
Direct Interelectrode Capacitances	
Grid Plate	6 uuf
Grid Filament	5.9 uuf
Plate Filament	0.8 uuf
Mechanical	
Base Medium Shell Small 4-Pin (A4-10)	
Length	6.50 max.
Diameter	2.063 max.
Cap	C1-5

Linear RF Power Amplifier - Class B

Maximum Ratings*

	572A		572B	
	CCS	ICAS	CCS	ICAS
DC Plate Voltage	2500	2500	2500	2500 V
DC Plate Current	200	310	225	350 Ma
DC Grid Current	50	65	60	75 Ma
DC Plate Input	425	575	500	650 W
Plate Dissipation	140	190	160	220 W
Grid Dissipation	18	18	20	20 W

*Tentative

TECHNICAL SPECIFICATIONS

Frequency Range	10, 15, 20, 40 and 75/80 Meter Amateur Bands
Type of Circuitry	Grounded Grid Employing Two Type
	572 A/B Carbon Plate High-Mu Triodes
Plate Power Input	1 KW DC for CW Operation
	1.5 KW PEP for SSB
	500 watts DC for AM
	600 watts DC for Controlled Carrier AM or RTTY
Power Gain	10 DB
RF Input Impedance	50 ohms, Nominal
RF Output Impedance	50 ohms
Power Requirements	Standby-100 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
	Transmit-1500 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
Size	17" wide, 9-1/2" deep, 9-1/8" high
Weight	66 lbs.

TUBE & SEMI-CONDUCTOR COMPLEMENT

2 572A/B Vacuum Tubes

2 1N34A Diodes

1 CER69A Diode

6 CER73 Diodes

UNPACKING AND INSTALLATION

Unpacking

After unpacking the HXL-ONE Linear Amplifier, examine it closely for any possible damage which may have occured during transit. The tubes are shipped separately to insure that they do not become damaged. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for any special instructions before removing or destroying them.

CAUTION

The high voltage of the HXL-ONE Amplifier is approximately 2000 volts. Therefore, extreme caution should be exercized at all times. The unit should not be powered unless its cabinet is firmly installed and the chassis of the amplifier is connected to a good ground.

Tubes

To install the tubes, it is necessary to remove the enclosure from the amplifier. This is accomplished by removing the hex head screws at the rear of the cabinet and withdrawing the panel and chassis. BEFORE TOUCHING ANY HIGH VOLTAGE CIRCUITRY IT IS SUGGESTED THAT THE PLATE CAPS FOR THE TUBES BE GROUNDED WITH A SCREWDRIVER WHICH HAS A WELL INSULATED HANDLE JUST TO MAKE SURE THAT THE HIGH VOLTAGE FILTER CAPACITORS ARE NOT HOLDING A CHARGE. The tubes should then be carefully inserted in their sockets and the plate caps clamped into place. Either 572A or 572B tubes may be employed. It is important to note, however, it is necessary to use identical types for proper operation, that is, two 572A's or two 572B's. Failure to do this will result in one tube handling more than its share of the load. After inserting the tubes, the cabinet should be put back on the unit before any attempt is made to apply power.

Note: If a soft rubber mat or padding material is used and the panel of the amplifier is placed face down on same, it will be found that the enclosure is more easily installed.

Power Source Requirements

The HXL-ONE is designed to be operated from a standard 110/120 volt, 50/60 cycle AC supply or, by making internal changes, from a 220/230 volt, 50/60 cycle AC supply. Due to the power requirements of this equipment, it should be definitely ascertained that the source is capable of supplying 15 amperes of AC power for 110/120 volt operation or 7.5 amperes for 220/230 volt operation.

As normally shipped from the factory, the amplifier is wired to be plugged into a standard 110 120 volt receptacle. For 220 230 volt operation it will be necessary to remove the unit from the case and reconnect the filament and plate power transformer primaries as called for on the schematic. Do not change the wiring of the fan motor. The motor is designed to operate from a 115 volt source only. With the primaries of the filament transformer wired for 230 volts, each one will have a drop of 115 Volts across it. The power to operate the fan motor is negligible, and the unbalance between the windings due to the motor load across one of them may be disregarded. In addition, for 220/230 volt operation, the power plug should be changed to the type used at the particular location and the third lead which is ground should be firmly connected to the chassis of the HXL-ONE before power is applied to the unit. Also, when changing from 110 to 220 volts (or vise versa) be sure to install the proper fuses. The fuse values are shown on Fig. 1.

Connection to Antenna and Exciter Unit

The HXL-ONE should be located reasonably close to the exciter unit. In a typical all Hammarlund station, the receiver is normally placed in the center with the exciter to the right or left hand side as convenient to the individual operator with the HXL-ONE Linear Amplifier on the other side. The antenna that formerly went to the exciter should now go to the RF OUTPUT of the HXL-ONE Linear Amplifier (See Fig. 1). For exciters having a built-in antenna relay, such as the HX-50, a short length of coaxial cable should be used to connect the output of the exciter to the input of the linear amplifier. In those installations where a separate antenna relay is used, the HXL-ONE Linear Amplifier should be connected between the transmit terminal of the antenna relay and the exciter unit. With this mode of operation the receiver associated with the exciter should be wired for blocking bias muting.

Note: If this muting feature is not available in the exciter, refer to the Instruction Manual of the appropriate equipment to determine what receiver muting circuitry should be employed when the exciter is used with a linear amplifier.

Figure 1 shows a view of the rear of the HXL-ONE chassis and indicates the connections from the unit to the exciter and the control contacts. The control connections from various exciters are indicated in Table 1. When making connections to transmitters other than type HX-50, it may be necessary to observe polarity with respect to ground. Terminal 2 of terminal board TB 101 of the HXL-ONE (marked RELAY on Fig. 1) is grounded, and in some transmitter exciters, the spare

contacts may have the common or swinger arm of the relay grounded. In this instance it will be necessary to observe proper polarity of connection (ground to ground, and hot to hot).

TABLE 1

RELAY CONNECTIONS FOR VARIOUS EXCITERS

TO HXL-ONE

Connect Relay of HXL-ONE to:

Exciter	Jack or Other	Terminal
HX-50	TB-101	8 and 7
HX-500	J-11	3 and 2
KWM-1	J-5	20 and 10
KWM-2	J-3	Ant. Relay and GND
32-S	Phono Jack	Ant. Relay and GND
TR-3	J-3	8 and 5
HT-32	SO-8	6 and 12 or 2 and 3
NCX-3	Ext. Relay	1 and 2
SW-240	Aux. Relay	T and C
Galaxy	J4	Phone Jack
SR-150	J7	10 and 11
SR-160	J7	10 and 11

Note: Be sure to connect the Ground Terminal (#2) of the HXL-ONE to the Ground Terminal of the EXCITER.

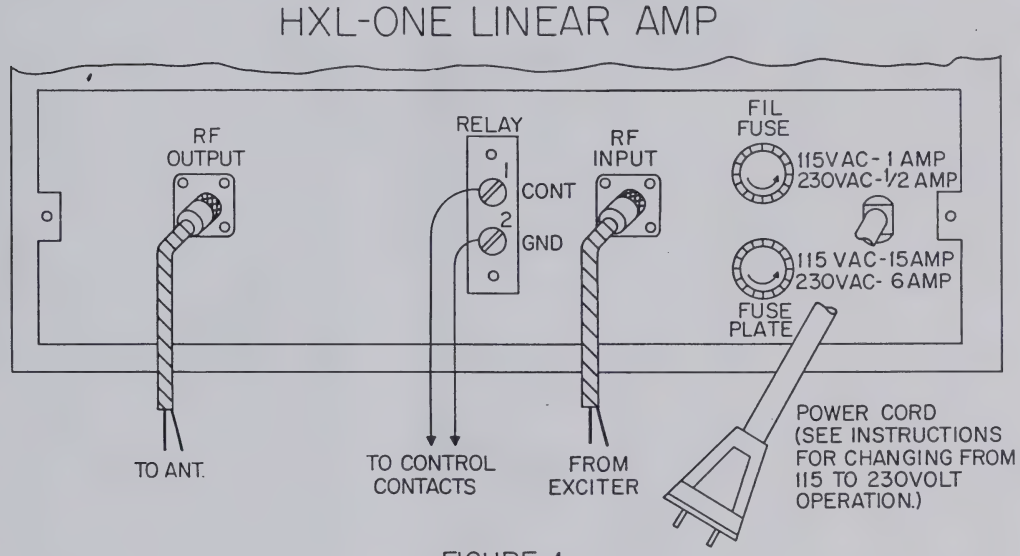


FIGURE 1

HXL-ONE CONNECTION POINTS AT REAR OF CHASSIS

Fig. 2 shows a typical arrangement for connecting the HXL-ONE to the HX-50 Transmitter. In this case the control contacts of the HXL-one may be connected indiscriminately to terminals 7 and 8 of TB101 of the HX-50 Transmitter since neither of the latter terminals is grounded.

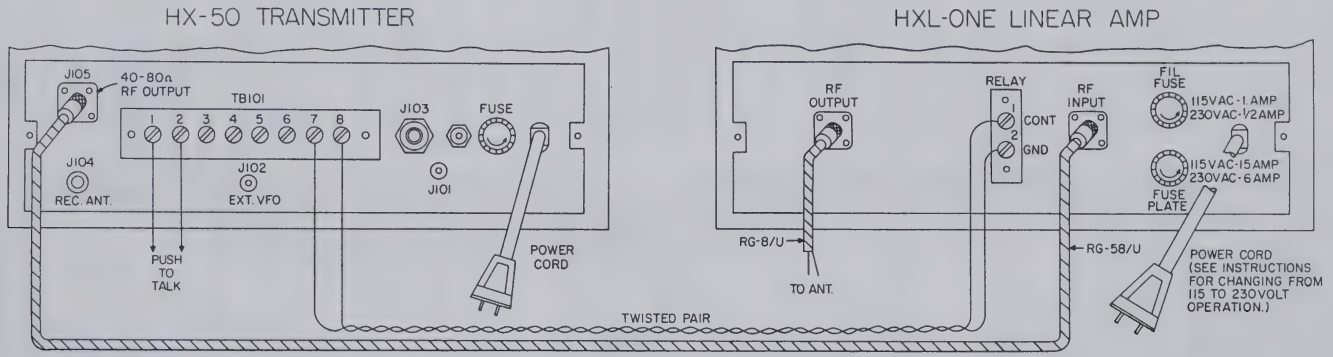


FIGURE 2

TYPICAL STATION CONTROL
HX-50 & HXL-ONE

OPERATION AND TUNE UP

Front Panel Controls and Meter Functions

Operating and tuning the HXL-ONE is accomplished entirely from the front panel. The various controls and meter functions are outlined below.

POWER ON-OFF SWITCH - This switch applies power to the primaries of the filament and plate transformers of the amplifier.

BAND - This control is used to set the amplifier on the desired band.

TUNE - This control is used for tuning the amplifier plate circuit to resonance.

BALANCE - This control is only effective with the meter switch in the LIN position. It is used to set the meter to zero for checking amplifier linearity.

INCREASE LOAD - This control provides a means for adjusting the amplifier output.

METER - The reading of the meter is in accordance with the settings of this control as follows:

PL MA - indicates the plate current drawn by the tubes.

PL HV - indicates the plate voltage.

Note: Plate voltage times plate current in amperes (500 ma = 0.5 amperes) equals DC plate power input. The relationship between the SSB suppressed carrier peak power and CW or single tone operation is roughly two times. This applies to the condition where limiting or suppressing devices are not used in the circuitry of the audio or RF sections of the transmitter/exciter.

RF VOLTS - indicates relative output voltage appearing across the output terminal of the unit.

LIN - compares the change in input signal to the change in output signal for checking linearity of the amplifier. It does not check the linearity of the exciter unit, nor does it indicate flat-topping.

Tune-up-Procedure

(1) With the HXL-ONE Linear Amplifier power switch in the OFF position, tune the exciter unit to its normal power output.

CAUTION: A dummy load (such as the Heath Cantenna) should be used while tuning up any transmitter. This is especially true of a high power linear amplifier and is extremely important, particularly during the time when the operator is becomming familiar with the operation of the new piece of equipment. ALWAYS TUNE UP INTO A DUMMY ANTENNA SO AS TO MINIMIZE INTERFERENCE ON THE AIR.

(2) Turn down the RF drive control on the exciter unit.

Note: If the exciter has no RF drive control or the RF drive control is ineffective on SSB, reduce the audio input to the exciter.

(3) Set the BAND control for the desired band and the TUNE control in the approximate position for the band in use.

(4) Set the LOAD control at the fully clockwise direction (minimum loading).

(5) Push the HXL-ONE Switch to ON, and apply enough RF drive from the exciter so as to produce about 250 milliamperes of plate current (Meter switch must be in PL MA position). Quickly rotate the TUNE control for a dip in plate current.

(6) Bring the RF drive control of the exciter up to the normal level and check the TUNE control for maximum dip in plate current.

Note: The normal level of the drive control is that level which produces sufficient output to drive the linear amplifier at its rated power input. In most cases it will be necessary to operate with the drive control below maximum output of the exciter.

(7) Turn the HXL-ONE LOAD control in a counter-clockwise direction which will produce an increase in plate current. By continually readjusting the TUNE control for a dip in plate current as the load is increased, a position of the LOAD control should be found which produces maximum RF output. With sufficient drive the amplifier may be loaded to 500 milliamperes plate current for CW and SSB operation. For AM the loading should be 275 milliamperes. For RTTY the plate current should be 300 milliamperes.

Note: Always finish the tune-up process by checking for dip with TUNE control.

For best linearity the loading of the amplifier should be increased just beyond the point of mximum power output. Proper loading of the amplifier occurs when the power output drops approximately 5% from the maximum and when the loading is on the over coupled side.

(8) Set the meter for checking the linearity of the amplifier by turning the meter switch to the LIN position. With the HXL-ONE operating in the SW mode, adjust the BALANCE control for a "0" meter reading. Under single sideband operation, the movement of the meter should remain virtually constant during modulation. Any appreciable downward deflection indicates non-linear operation and should be avoided.

THEORY OF OPERATION

General

The HXL-ONE operates as a grounded grid. Class B RF linear amplifier. In addition to the RF and meter circuitry, the power supply and an antenna changeover relay are included within a single enclosure. A schematic diagram of the amplifier is included at the rear of this manual and should be referred to in connection with the following description.

Input Circuit

A broadband input circuit which includes a tapped ~~bifilar wound input coil L105A~~ coil L112, couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the BAND switch S102. It automatically selects the proper tap on ~~L105A~~ L112 to which the input is connected for best drive efficiency.

A sampling circuit consisting of R104, R105, C115 and CR #102 supplies a DC voltage, proportional to the applied RF from the exciter, to the metering circuit. The DC thus obtained in used to check the linearity of the amplifier as is explained in a subsequent paragraph.

Bias Circuit

The bias circuit. CR #103 and C #118 performs two functions. First, it is a source of voltage employed to operate the antenna transfer relay K101, and second, it supplies a small negative DC voltage to the grids of the 572A/B tubes during standby. Although the tubes are high mu zero bias triodes, the application of a small bias reduces the standby plate current to a very low value and eliminates the "shot noise" generated by the electron flow of the amplifier from getting into the associated receiver.

Output Circuit

The plate or output circuit is tuned by a Pi network consisting of C106, L103, L104 and C109. In addition C107 and C108 are automatically switched in on the lower frequency bands. Variable capacitor C106 resonates the plate tank circuit and is adjusted by operating the TUNE control on the front panel. The three-gang capacitor C109 is varied by operating the LOAD control. Its function is to attain a match between the output of the amplifier and the impedance presented by the antenna load and its feed system. To attain the best efficiency of operation, the VSWR of the antenna system should be no greater than 2:1.

A sampling circuit R107, R108, C110, CR101 and R109 assicoated with the amplifier output has two functions. When the meter switch is in the RF VOLTS position, a portion of the RF at the output termination is rectified and indicates the RF voltage at the output of the amplifier. The voltage as indicated, however, is only approximate to within 20% and will vary with frequency. If the impedance at this point is known the power output may be calculated roughly by using the formula E^2/R where E is the indicated voltage and R is the impedance.

Linearity Circuit

The second function of the output sampling circuit is to check the linearity of the amplifier. It is not designed to replace the more elaborate and preferred means of checking linearity with an oscilloscope or similar type modulation checker which employs oscilloscope techniques. An instrument such as the Heath Monitor Scope is highly recommended as a permanent station accessory.

With the meter switch in the LIN position, the voltage from the input circuit is balanced by an equal voltage from the output circuit. A balance between the two is attained by means of variable resistor R121 marked BALANCE. As long as the ratio of the two voltages remains constant the meter indication will be zero. However, if by increasing the input power there is no longer an increase of output power the meter will be caused to swing away from zero, indicating that saturation has been reached. During modulation a slight wiggle of the meter may be noted. This is normal and is due to a slight non-linearity of the tube characteristics. Violent swings of the meter should be avoided. It must be pointed out that the linearity circuit will not indicate flat-topping of the exciter.

Antenna Relay

The double pole-double throw antenna relay is wired to permit the antenna to bypass the amplifier during periods that the amplifier is OFF or during periods that the relay is not actuated by an external device.

Power Supply

Both the filament and plate transformers have dual primaries which are connected in parallel for 115 Volt operation and in series for 230 Volt operation. The plate supply employs a voltage doubler circuit in which CR104 thru CR109 are silicon rectifiers and C123 thru C128 are the filter capacitors. To eliminate the current drawn by the bleeder from the metering circuit, the bleeder resistor R119 is not directly connected to ground.

The plate milliamperes drawn by the tubes is a function of the current thru a one ohm resistor R118. When the tubes draw 500 milliamperes, 1/2 volt appears across the resistor and the meter multiplier resistor R120 in conjunction with internal resistance of the meter acts as a voltmeter but is calibrated in milliamperes.

* as per addendum No. 9010-15-00001.

MAINTENANCE

General

The HXL-ONE Linear Amplifier is designed to give years of trouble free service. Under normal conditions, it requires little attention. Because the equipment is ventilated by a fan, dust may accumulate on the switches and other components within the enclosure. It is suggested, therefore, that the unit be removed from the cabinet and cleaned approximately every six months or oftener if it is located in a dusty area. The preferred method of cleaning is to use a vacuum cleaner while dusting with a clean brush.

While the unit is out of the cabinet, inspect the relay contacts for burning or pitting. To clean the contacts, use a burnishing tool or the finest grit sandpaper. Do not use emery cloth or "crocus" cloth. After burnishing or sandpapering, clean thoroughly with alcohol, carbon tetrachloride or other cleaning agent.

Twice a year, a drop or two of light oil should be applied to the bearings of the fan motor.

Neutralizing

To check neutralization, tune up the amplifier on the 10 meter band with the amplifier connected to a dummy load such as the Heath Cantenna to which a VTVM can be attached. Turn the TUNE control back and forth through resonance and note that the maximum output power occurs at the plate current dip. If necessary readjust the neutralizing capacitor C105.

BEFORE MAKING ADJUSTMENTS OF THE NEUTRALIZING CAPACITOR TURN OFF THE POWER TO THE AMPLIFIER.

RF Output Metering Circuit Adjustment

Capacitor C110 in the RF output metering circuit is used to equalize the meter readings over a relatively wide frequency range. This adjustment is normally set at the factory, however, if it is suspected that re-adjustment is required it will be necessary to temporarily make use of a calibrated RF wattmeter. To reset C110 load the transmitter and linear amplifier into a dummy load whose calibration is relatively flat over the frequency ranges concerned. Load the amplifier for an output wattmeter reading of 400 watts in the 80 meter band. Note the meter reading with the meter selector switch in the RF Volts position. Next tune to 20 meters and reload the amplifier for 400 watts. Note the meter reading (RF VOLTS) again. Re-adjust C110 if necessary to produce the same meter reading as when the amplifier was tuned up on the 80 meter band. On the basis of a pure 50 ohm load, the voltmeter should indicate 141 volts.

Note: It is extremely important that the amplifier be loaded to the same RF power output into the dummy load in all of these tests.

Now return to the 80 meter band and notice the meter reading. If it is within 10% of the 20 meter reading make no further adjustments. If in excess of 10%, re-adjust C110 and then recheck on the 20 meter band. After two or three cycles of rechecking a setting of C110 should be found which produces the desired condition.

Bandswitch Selector

Should the cord operating the band switch selector require replacement refer to Figure 3 which shows the details of this operation.

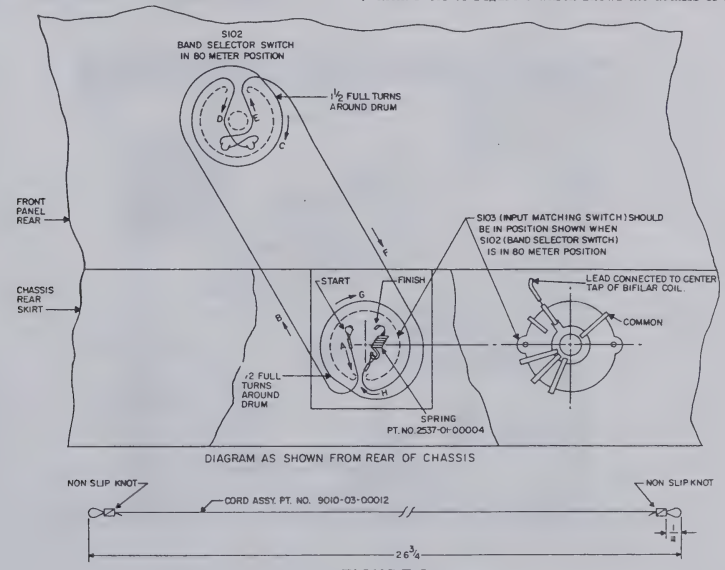


FIGURE 3

BAND SELECTOR & INPUT MATCHING SWITCH DRIVE ASSY.

Trouble Shooting

Most troubles, should they occur, can be readily located by the average amateur radio operator. Refer to the schematic drawing in the back of the manual and Figures 4 and 5 which are top and bottom views of the chassis and indicate the location of the principal components. A parts list is contained in Section 7. This gives component values and Hammarlund part numbers. Should difficulty be experienced with the equipment please write the Hammarlund Manufacturing Company for advice or to arrange for factory service.

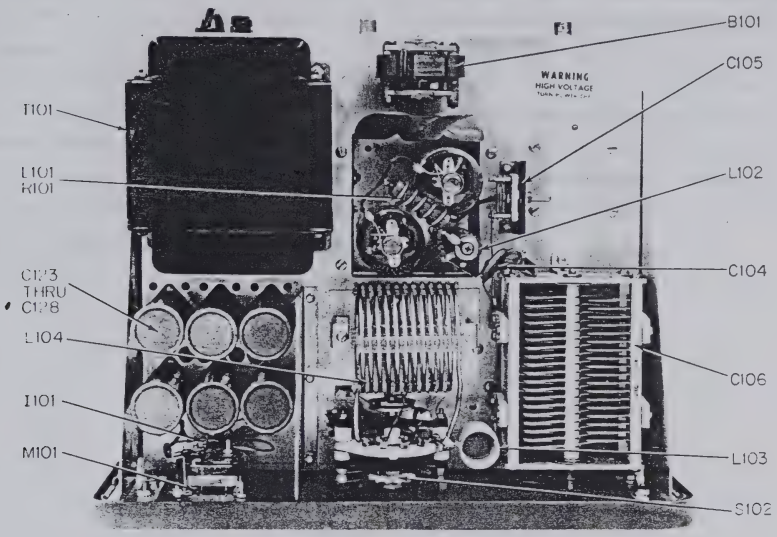


Fig. 4 – Top View of Chassis

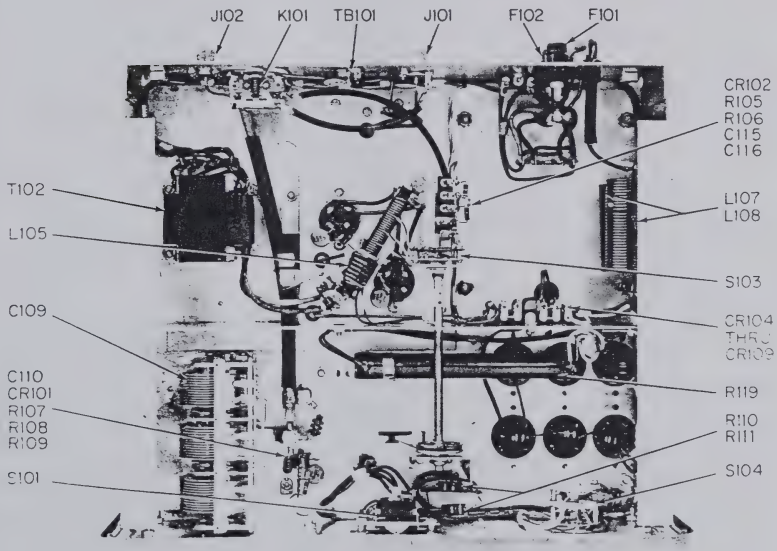


Fig. 5 – Bottom View of Chassis

SOME USEFUL NOTES & HINTS

The article entitled "How To Run Your Linear" which appeared in QST for November 1962, should be referred to for background and theory of operation of linear amplifiers.

220 Volt operation is recommended for best performance, particularly at the maximum plate power inputs, as the reduced primary amperage results in lower voltage drops in house wiring, thereby providing improved regulation of the high voltage circuitry.

It may be necessary to slightly re-tune the exciter for maximum drive to the amplifier on the various bands. When switching to straight through reduced power operation, the exciter unit should normally not require any re-tuning.

When modulating the HXL-ONE in SSB service, the plate current swing should be between 300 and 400 milliamperes on voice peaks.

On the 10 and 15 meter bands, minimum loading may not occur at the fully clockwise position of the loading control. The correct setting is counter-clockwise from that position which produces minimum loading.

Do not decrease the loading of the amplifier to reduce plate power input. The amplifier must be loaded for maximum input consistent with maximum output. The drive of the exciter should be reduced if less plate power input to the amplifier is desired. This will assure maximum linearity.

While the loading and tuning adjustments may be used to reduce a small impedance difference between the amplifier and the antenna system, it is highly desirably to have the standing wave ratio of the antenna system as low as possible to provide best performance. With an appreciable SWR the tuning indications will vary widely from those marked on the front panel.

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	MOTOR	
B101	Motor, 115 V-60 Cycles, AC	3510-02-00002
	CAPACITORS	
C101, C102, C113	Fixed, Ceramic disk, .005 mfd ± 20%, 500 V	1509-01-01020
C103, C104	Fixed, Ceramic disk, .0022 mfd, ± 20%, 6000V	1509-02-01034
C105	Variable, Neutralizing, 2-10 mmf	9411-03-31108
C106	Variable, Tuning Included in L103	9412-90-11030
C107, C108	Fixed, Mica, 820 mmf ± 10%, 500V	1519-02-02002
C109	Variable, Loading	9010-03-00005
C110	Trimmer, N750, 8-50 mmf, 350V	1513-01-00002
C111, C112, C116, C117, C119, C120, C121, C122	Fixed Ceramic disk, .01 mfd GMV, 500V	1509-02-01033
C114	Fixed Ceramic disk, .1 mfd +80-20%, 100V	1509-01-01018
C115	Fixed, Dur Mica DM-15 4 mmf ± 5 mmf 500V	1519-02-00025
C118	Electrolytic 250 mfd 25V	1515-02-01008
C123, C124, C125, C126, C127, C128	Electrolytic 100 mfd 450V	1515-01-00001
* C129	DISC-CERAMIC, .1 MFD +80-20%	1509-01-01018
* C130	~~DURA~~ MICA DM-15 500V 1pF ± .5pf	1519-01-00023
	DIODES	
CR101, CR102	Germanium Diode 1N34A (RF Indicator)	4823-02-00001
CR103	Silicon Diode CER69A (Bias & Relay)	4804-02-00002
CR104, CR105, CR106, CR107, CR108, CR109	Silicon Diode CER73 (High Voltage)	4808-02-00002

* SEE PAGE 14 FOR ADDITIONAL CAPACITORS

* as per addendum No 9010-15-00001

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	FUSES	
F101	Fuse, ABC, 15 Amp. for 115V operation (plate)	5134-02-00206
F102	Fuse, SLO-BLO, 3AG, 1 Amp. for 115 V operation	5134-02-00002
F101	Fuse, ABC, 6 Amp. for 230V operation (plate)	5134-02-00207
F102	Fuse, SLO-BLO, 3AG, 1/2 Amp. for 115V operation	5134-02-00006
	LAMP	
I 101	Lamp Incandescent #47	3901-01-00001
	CONNECTORS	
J101	Connector, RF Input Receptacle	2111-01-00001
J102	Connector, RF Output Receptacle	2111-01-00001
	RELAY	
K101	Relay, Antenna	4531-02-00001
	COILS	
* ~~L101~~	~~Parasitic RF Inductor Assembly (with plate caps)~~	~~9010-03-00011~~
L102	RF Choke, 96 Millihenries	1804-02-00053
L103	Inductance Coil, Included in C106	See C106
L104	Inductor, PA Plate Tank	1805-02-00060
L105	Coil Assembly. Includes L105A and L105B	9010-03-00002
L105A	Coil, Bifilar Included in L105	See L105
L105B	Coil, Neutralizing Included in L105	See L105
L107	RF Choke	1805-02-00120
L108	RF Choke	1805-02-00120
L109	RF Choke, 2.5 Millihenries	1802-01-00001
* L110 - L111	CHOKE, PARASITIC	1806-02-00040
* L112	INPUT, MATCHING	1804-02-00061.

* as per addendum No. 9010-15-00001

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	METER	
M101	Meter (Special)	2902-02-00001
	RESISTORS	
~~R101~~	~~5 ohms, 10W., ± 10%~~	~~See L101~~
R102, R103	47 ohms, 1W., ± 10%	4704-01-00616
R104	10K, 1/2W., ± 10%	4703-01-00344
R105	18K, 1/2W., ± 10%	4703-01-00335
R106	15K, 1/2W., ± 10%	4703-01-00346
R107	22K, 2W., ± 10%	4705-01-00948
R108	820 ohms, 1/2W., ± 10%	4703-01-00331
R109	10K, 1/2W., ± 10%	4703-01-00344
R110, R111	1.3 megohms, 2W., ± 5%	4705-02-01122
R112, R113, R114, R115, R116, R117	470K, 1W., ± 10%	4704-01-00664
R118	1 ohm, 5W., ± 10%	4713-01-00002
R119	75K, 100W., Wirewound	4715-02-00101
R120	820 ohm, 1/2W., ± 5%	4703-02-00445
R121	Variable, 10K, ± 30%, Balance	4735-02-01013
* R-122-123-124-125	470 Ω ± 10% 2W	4705-01-00928
	SWITCHES	
S101	Switch, Power	5111-02-00001
S102	Switch, 5 Pos., Band Selector	5106-02-00004
S103	Switch, RF Input Matching	~~5106-02-00002~~ * 5106-02-00021
S104	Switch, 4 Pos., Meter Function	5107-02-00005
	TRANSFORMERS	
T101	Power Transformer	5601-02-00001
T103	Filament Transformer	5602-02-00001
	VACUUM TUBES	
V101, V102	Electron, 572A/B	5731-02-00001

* as per addendum No. 9010-15-0001

MISCELLANEOUS PARTS

DESCRIPTION	PART NO.
Fan	2604-02-00002
Knob 2" Diameter (Tune & Band)	2430-02-00087
Knob 3/4" Diameter (Balance)	2430-01-00082
Knob 1-1/2" Diameter (Meter & Load)	2430-02-00085
Spring (String Drive, Band Selector)	2537-01-00004
Band Selector Drive Cord Assembly	9010-03-00012
Mounting Screws, Steel (Cabinet to Chassis)	2838-54-10120
Washer, flat steel (Cabinet to Chassis)	2898-64-11005
Fuse Holder and Cap	5136-01-00001
Instruction Book	52791-1
CLip, TUBE	2117-02-0002

* CAPACITORS:

C 131	DUR-MICA	DM-15,	33 Pf. ± 2%	500V	1519-01-00086
C 132	" "	" ,	62pf ± 2%	"	1519-01-00056
C 133	" "	" ,	220pf ± 5%	300V	1519-01-00007
C 134	" "	DM-19,	510 pf ± 5%	500V	1519-01-03002

Changes or additions as per Addendum No. 9010-15-0001

Instructions for re-installing Xformer of HXL-1

Glen.

Replace the transfer as per attached label on rear of transformer. The bolts + nuts are taped to the chassis in an orange sack. The 4 lead cluster goes through the rearward grommeted hole for - attachment to the 4 lug terminal strip numbered 1-4 and colored discription of each lead as per label.

After installing transformer - place chassis on its left side as viewed from the front. (So all the weight is low on the table) the 4 lug term. strip is then number 1-4 from the top down and the color code on each lead starts as No 1. = Black-Red Str. No 2 = Black with green stripe, No 3 Black with yellow stripe + No 4 - Pure Black.

also - No 1 lug has a black + brown lead on it so there'll now be 3 leads on lug no 1.

No 2 lug has a black additional lead - now there be 2 leads on it

No 3 lead has a brown lead also - total 2 on it.

+ No 4 lug has 2 extra black leads which total 3 for it when Xformer lead is on. It is at the terminal strip that you'll change the wiring for 220/230 Volts. It is wired for 110V now.

Fly 2 red leads with heavy insulation on through the front most grommeted hole.

The long red - 6" long - goes to the lug X and Connects to upper st. capacitor lug with the symbol ⌓ on it by that lug is also the 470Ω resistor and a black lead. Now there'll be 3 leads on it. (I tied a short piece of heavy hook-up wire to the proper lug so you'll know where it is and to set the resist

(over)

The short red lead (2" long) goes to the nearest terminal strip. Label numbered from bottom — ↑ upward - it's labeled. The short red lead goes to lug no. 3. This lug also has a bare wire on it, as a diode lead. Now there will be 3 leads on it - make sure the short lead is on it. I used a heat sink on the diode lead when I soldered it. (I verified the correct lug for the shorted transformer lead by twisting a piece of red hook-up wire on it).

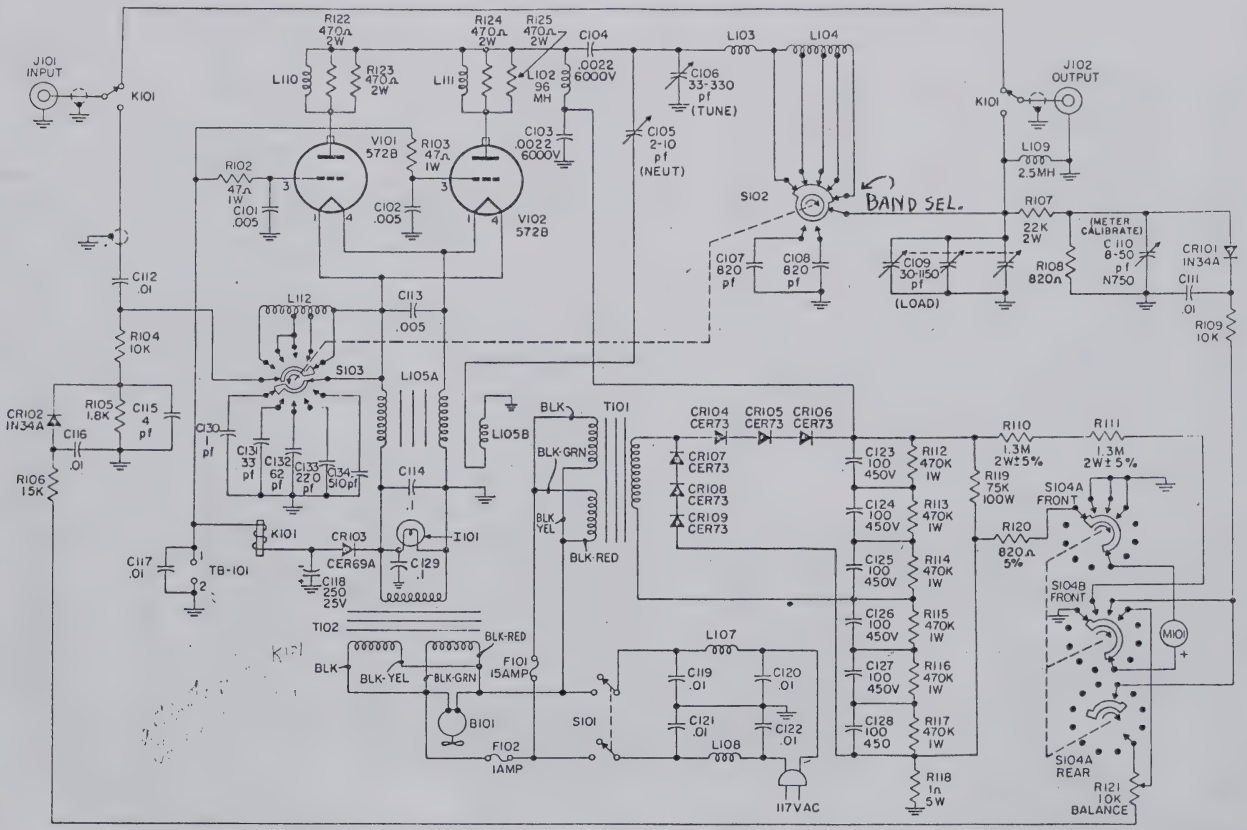
So that is Geo. You shouldn't have any problem. Hopefully Dave measured up to your std.
The transformer is all taped and will be packed in a well padded apple box.

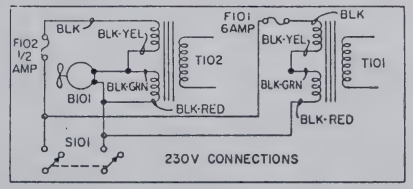
None of any of the adjustable resistors have been tampered with. You will have a free unit + your idea to remove the transformer was a good one.

Best of Harmonizing Geo.

Sincerely
Ken Lugo

P.S. So it might be also a good idea Geo, to further satisfy yourself by checking the Schematic.





NOTES: 1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS ARE 1/2 W ±10% UNLESS OTHERWISE SPECIFIED.
3. S102 & S103 SHOWN IN 10M POSITION.
4. S104 1 - PL MA
2 - PL HV
3 - RF VOLTS
4 - LINEARITY
5. S104 SHOWN IN PL MA POSITION
6. WHEN 230V CONNECTION IS USED, CHASSIS SHALL BE CONNECTED TO POWER GROUND.

SCHEMATIC DIAGRAM
LINEAR AMPLIFIER (HXL-ONE)

ADDENDUM
TO
TECHNICAL DESCRIPTION AND OPERATING INSTRUCTION MANUAL NUMBER 52791-1
HXL-ONE LINEAR AMPLIFIER

THEORY OF OPERATION

Page 7 (Input Circuit)

Change 1st paragraph to read as follows:

A broadband input circuit which includes a tapped coil L112, couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the band switch S102. It automatically selects the proper tap on L112 to which the input is connected for best drive efficiency.

CHANGES TO PARTS LIST

Page 11	Hammarlund Part No.
1. Add capacitor C129 Disc-ceramic, .1 mfd +80-20%	1509-01-01018
2. Add capacitor C130 Dur-mica DM-15, 1 pf ±.5 pf, 500V	1519-01-00023
3. Add capacitor C131 Dur-mica DM-15, 33 pf ±2%, 500V	1519-01-00086
4. Add capacitor C132 Dur-mica DM-15, 62 pf ±2%, 500V	1519-01-00056
5. Add capacitor C133 Dur-mica DM-15, 220 pf ±5%, 300V	1519-01-00007
6. Add capacitor C134 Dur-mica DM-19, 510 pf ±5%, 500V	1519-01-03002

Page 12

1. Delete coil L101 Parasitic RF Inductor Assembly (with plate caps)	9010-03-00011
2. Add coil L110, Choke Parasitic	1806-02-00040
3. Add coil L111, Choke Parasitic	1806-02-00040
4. Add coil L112, Input Matching	1804-02-00061

Page 13

1. Delete resistor R101, 5 Ω, ±10%, 10W.	
2. Add resistor R122 470 Ω ±10%, 2W.	4705-01-00928
3. Add resistor R123 470 Ω ±10%, 2W.	4705-01-00928
4. Add resistor R124 470 Ω ±10%, 2W.	4705-01-00928
5. Add resistor R125 470 Ω ±10%, 2W.	4705-01-00928
6. Change switch S103 from 5106-02-00002 to ----------	5106-02-00021

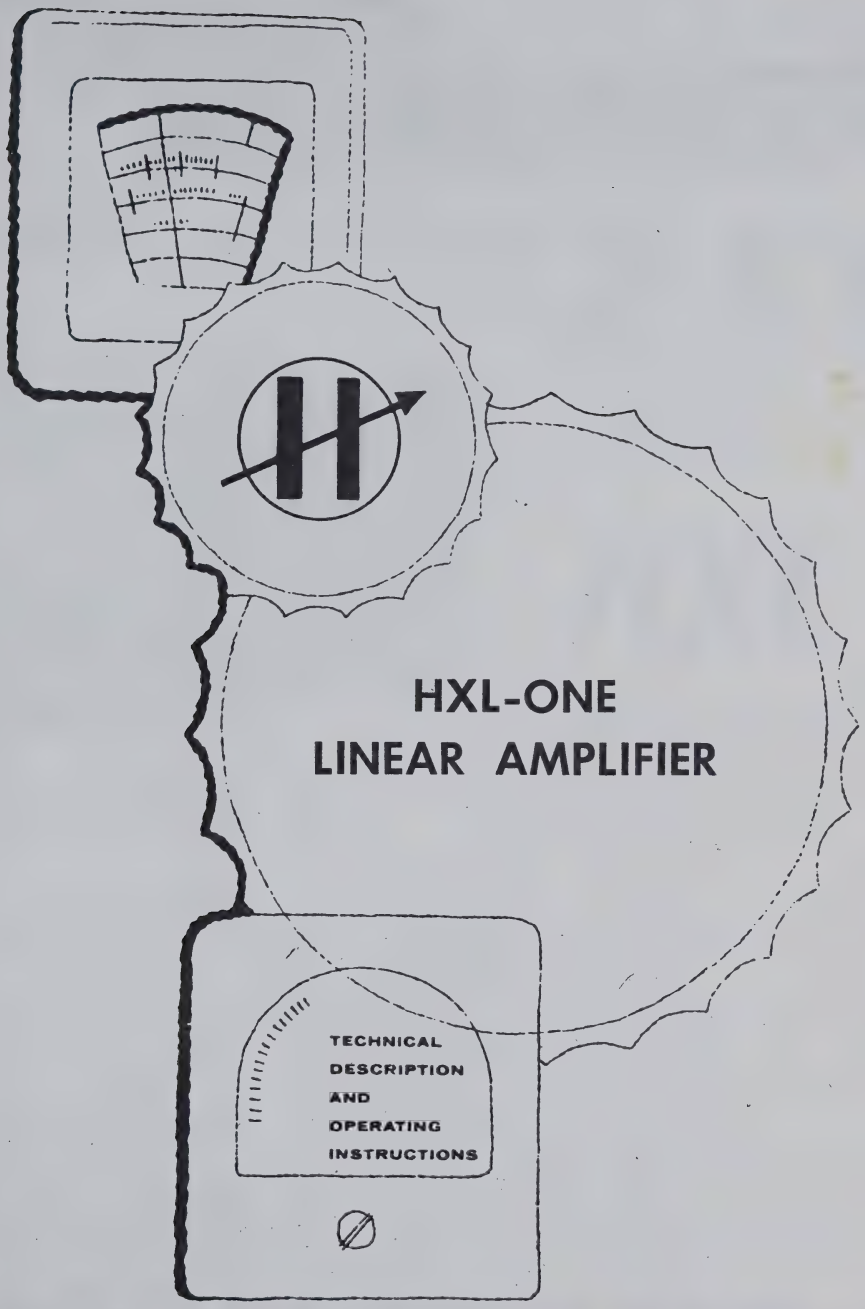
Page 14

1. Add Clip, Tube cap	2117-02-00002

NOTE: Disregard Schematic Diagram in present manual, use new Schematic furnished with this Addendum.

Addendum No. 9010-15-00001

ESTABLISHED 1910



HXL-ONE
LINEAR AMPLIFIER

TECHNICAL
DESCRIPTION
AND
OPERATING
INSTRUCTIONS

Established 1910

HAMMARLUND

Hammarlund Manufacturing Company, Inc.

A Giannini Scientific Corporation

Mars Hill, Madison County, North Carolina

52791-1

HAMMARLUND DESK TOP LINEAR

the smallest self-contained

2 KW

PEAK POWER INPUT

$467.95

HXL-1

linear amplifier

Hammarlund tradition demands quality one notch better than the rest!

So—you get . . .

. . . rugged, widespaced, industrial type tuning capacitors made by the most famous name in capacitors—Hammarlund!

. . . rigidly mounted "Hi Q," low loss tank coil for maximum power output!

. . . oversize power transformer specially designed to handle "peak power" requirements!

. . . no RF watt meter needed for proper tune up. RF output scale and linearity test provide all you need for tuning up your linear! Shows improper loading and overdrive!

. . . Pi-network output circuit for efficient power transfer to your antenna!

. . . high efficiency blower keeps final tubes cool for long operating life.

FEATURES

- Complete 80 through 10 meter coverage!
- Compatible with HX-50A or any 70-100 watt exciter!
- "Wide-band" grounded grid input circuit!
- "Instant power"—no warm up needed!
- Built in DC operated antenna relay for chatter-free operation.
- Circuits monitored by multi purpose meter.
- Solid state, long life power supply.
- Control circuitry compatible with most exciters.

HXL-ONE
LINEAR AMPLIFIER

Covering the 10, 15, 20, 40 and 75/80 meter Amateur Bands rated at 1 Kilowatt DC input for CW operation, 1.5 Kw PEP SSB input, and 500 Watts DC input on conventional AM or 600 Watts DC input on Controlled Carrier AM and RTTY.

INSTRUCTION MANUAL

ESTABLISHED 1910

Type HXL–ONE Linear Amplifier

THE HAMMARLUND MANUFACTURING COMPANY
A Giannini Scientific Corporation
Mars Hill, Madison County, North Carolina

INTRODUCTION

The Hammarlund type HXL-ONE Linear Amplifier is a ruggedly built high performance amplifier designed to match the Hammarlund HX-50 Transmitter. However, it may be used with other transmitters/exciters or transceivers of similar power rating. ☆

The HXL-ONE Linear Amplifier is of the "grounded grid" type and is completely self-contained. It employs a pair of type 572A/B United Electronics Zero Bias Carbon Plate Triodes. The 572A/B tube has a plate dissipation rating of approximately three 811's and, therefore, a pair may be compared to six 811A's in parallel. The 572B tube, used in the later models of the amplifier, is an improved version of the type 572A. Both tubes carry substantially the same ratings. However, the 572B is somewhat easier to drive in grounded grid service.

The HXL-ONE contains its own high voltage supply, standby bias, control circuitry and metering arrangements. The control circuitry has been designed to allow the exciter unit to drive the antenna directly when the HXL-ONE switch is in the OFF position. Turning the power switch ON results in instantaneous boosted power whenever the exciter is in the "transmit" mode, whether it be by manual (MOX) voice or (VOX) operation.

TYPE 572A AND 572B VACUUM TUBES

General Characteristics

Electrical	
Filament: Bonded Thoria	
Voltage	6.3 Volts
Current	4.0 Amperes
Amplification Factor	
572A	170
572B	200
Direct Interelectrode Capacitances	
Grid Plate	6 uuf
Grid Filament	5.9 uuf
Plate Filament	0.8 uuf
Mechanical	
Base Medium Shell Small 4-Pin (A4-10)	
Length	6.50 max.
Diameter	2.063 max.
Cap	C1-5

Linear RF Power Amplifier - Class B

Maximum Ratings*

	572A		572B	
	CCS	ICAS	CCS	ICAS
DC Plate Voltage	2500	2500	2500	2500 V
DC Plate Current	200	310	225	350 Ma
DC Grid Current	50	65	60	75 Ma
DC Plate Input	425	575	500	650 W
Plate Dissipation	140	190	160	220 W
Grid Dissipation	18	18	20	20 W

*Tentative

TECHNICAL SPECIFICATIONS

Frequency Range	10, 15, 20, 40 and 75/80 Meter Amateur Bands
Type of Circuitry	Grounded Grid Employing Two Type
	572 A/B Carbon Plate High-Mu Triodes
Plate Power Input	1 KW DC for CW Operation
	1.5 KW PEP for SSB
	500 watts DC for AM
	600 watts DC for Controlled Carrier AM or RTTY
Power Gain	10 DB
RF Input Impedance	50 ohms, Nominal
RF Output Impedance	50 ohms
Power Requirements	Standby-100 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
	Transmit-1500 watts, 110/120 or 220/230 volts,
	50/60 cycles, AC
Size	17" wide, 9-1/2" deep, 9-1/8" high
Weight	66 lbs.

TUBE & SEMI-CONDUCTOR COMPLEMENT

2 572A/B Vacuum Tubes

2 1N34A Diodes

1 CER69A Diode

6 CER73 Diodes

UNPACKING AND INSTALLATION

Unpacking

After unpacking the HXL-ONE Linear Amplifier, examine it closely for any possible damage which may have occured during transit. The tubes are shipped separately to insure that they do not become damaged. Should any sign of damage be apparent, file a claim immediately with the carrier stating the extent of damage. Carefully check all shipping labels and tags for any special instructions before removing or destroying them.

CAUTION

The high voltage of the HXL-ONE Amplifier is approximately 2000 volts. Therefore, extreme caution should be exercized at all times. The unit should not be powered unless its cabinet is firmly installed and the chassis of the amplifier is connected to a good ground.

Tubes

To install the tubes, it is necessary to remove the enclosure from the amplifier. This is accomplished by removing the hex head screws at the rear of the cabinet and withdrawing the panel and chassis. BEFORE TOUCHING ANY HIGH VOLTAGE CIRCUITRY IT IS SUGGESTED THAT THE PLATE CAPS FOR THE TUBES BE GROUNDED WITH A SCREWDRIVER WHICH HAS A WELL INSULATED HANDLE JUST TO MAKE SURE THAT THE HIGH VOLTAGE FILTER CAPACITORS ARE NOT HOLDING A CHARGE. The tubes should then be carefully inserted in their sockets and the plate caps clamped into place. Either 572A or 572B tubes may be employed. It is important to note, however, it is necessary to use identical types for proper operation, that is, two 572A's or two 572B's. Failure to do this will result in one tube handling more than its share of the load. After inserting the tubes, the cabinet should be put back on the unit before any attempt is made to apply power.

Note: If a soft rubber mat or padding material is used and the panel of the amplifier is placed face down on same, it will be found that the enclosure is more easily installed.

Power Source Requirements

The HXL-ONE is designed to be operated from a standard 110/120 volt, 50/60 cycle AC supply or, by making internal changes, from a 220/230 volt, 50/60 cycle AC supply. Due to the power requirements of this equipment, it should be definitely ascertained that the source is capable of supplying 15 amperes of AC power for 110/120 volt operation or 7.5 amperes for 220/230 volt operation.

As normally shipped from the factory, the amplifier is wired to be plugged into a standard 110/120 volt receptacle. For 220/230 volt operation it will be necessary to remove the unit from the case and reconnect the filament and plate power transformer primaries as called for on the schematic. Do not change the wiring of the fan motor. The motor is designed to operate from a 115 volt source only. With the primaries of the filament transformer wired for 230 volts, each one will have a drop of 115 Volts across it. The power to operate the fan motor is negligible, and the unbalance between the windings due to the motor load across one of them may be disregarded. In addition, for 220/230 volt operation, the power plug should be changed to the type used at the particular location and the third lead which is ground should be firmly connected to the chassis of the HXL-ONE before power is applied to the unit. Also, when changing from 110 to 220 volts (or vise versa) be sure to install the proper fuses. The fuse values are shown on Fig. 1.

Connection to Antenna and Exciter Unit

The HXL-ONE should be located reasonably close to the exciter unit. In a typical all Hammarlund station, the receiver is normally placed in the center with the exciter to the right or left hand side as convenient to the individual operator with the HXL-ONE Linear Amplifier on the other side. The antenna that formerly went to the exciter should now go to the RF OUTPUT of the HXL-ONE Linear Amplifier (See Fig. 1). For exciters having a built-in antenna relay, such as the HX-50, a short length of coaxial cable should be used to connect the output of the exciter to the input of the linear amplifier. In those installations where a separate antenna relay is used, the HXL-ONE Linear Amplifier should be connected between the transmit terminal of the antenna relay and the exciter unit. With this mode of operation the receiver associated with the exciter should be wired for blocking bias muting.

Note: If this muting feature is not available in the exciter, refer to the Instruction Manual of the appropriate equipment to determine what receiver muting circuitry should be employed when the exciter is used with a linear amplifier.

Figure 1 shows a view of the rear of the HXL-ONE chassis and indicates the connections from the unit to the exciter and the control contacts. The control connections from various exciters are indicated in Table 1. When making connections to transmitters other than type HX-50, it may be necessary to observe polarity with respect to ground. Terminal 2 of terminal board TB 101 of the HXL-ONE (marked RELAY on Fig. 1) is grounded, and in some transmitter exciters, the spare

contacts may have the common or swinger arm of the relay grounded. In this instance it will be necessary to observe proper polarity of connection (ground to ground, and hot to hot).

TABLE 1

RELAY CONNECTIONS FOR VARIOUS EXCITERS

TO HXL-ONE

Exciter	Connect Relay of HXL-ONE to: Jack or Other	Terminal
HX-50	TB-101	8 and 7
HX-500	J-11	3 and 2
KWM-1	J-5	20 and 10
KWM-2	J-3	Ant. Relay and GND
32-S	Phono Jack	Ant. Relay and GND
TR-3	J-3	8 and 5
HT-32	SO-8	6 and 12 or 2 and 3
NCX-3	Ext. Relay	1 and 2
SW-240	Aux. Relay	T and C
Galaxy	J4	Phone Jack
SR-150	J7	10 and 11
SR-160	J7	10 and 11

Note: Be sure to connect the Ground Terminal (#2) of the HXL-ONE to the Ground Terminal of the EXCITER.

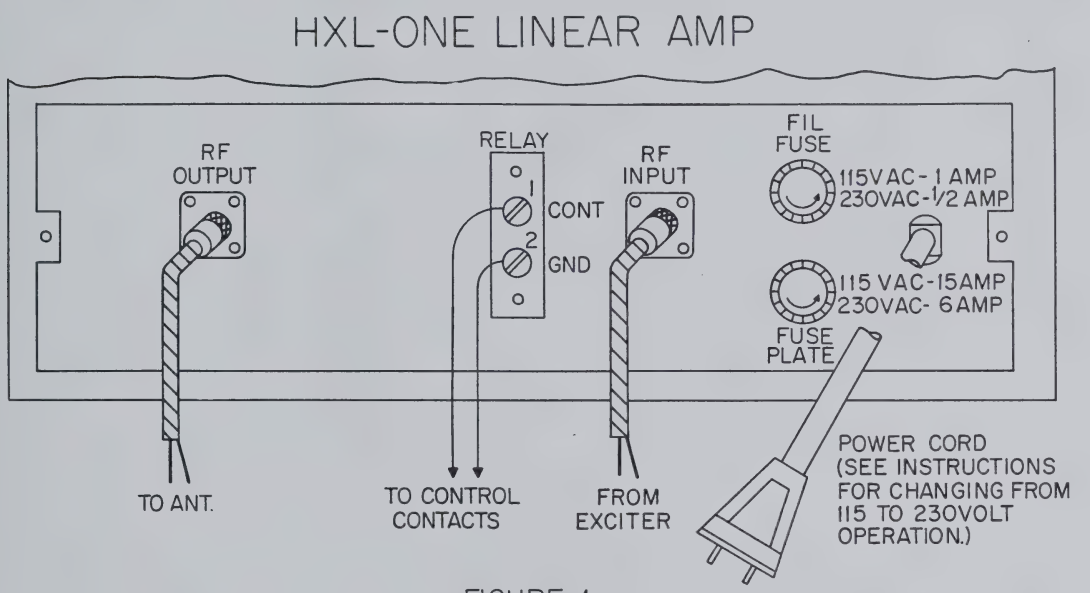


FIGURE 1

HXL-ONE CONNECTION POINTS AT REAR OF CHASSIS

Fig. 2 shows a typical arrangement for connecting the HXL-ONE to the HX-50 Transmitter. In this case the control contacts of the HXL-one may be connected indiscriminately to terminals 7 and 8 of TB101 of the HX-50 Transmitter since neither of the latter terminals is grounded.

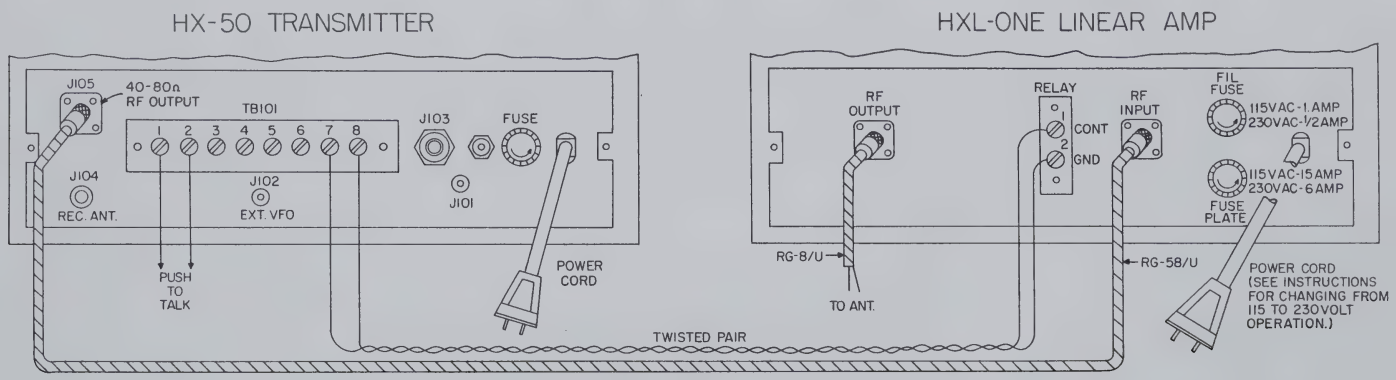


FIGURE 2

TYPICAL STATION CONTROL
HX-50 & HXL-ONE

OPERATION AND TUNE UP

Front Panel Controls and Meter Functions

Operating and tuning the HXL-ONE is accomplished entirely from the front panel. The various controls and meter functions are outlined below.

POWER ON-OFF SWITCH - This switch applies power to the primaries of the filament and plate transformers of the amplifier.

BAND - This control is used to set the amplifier on the desired band.

TUNE - This control is used for tuning the amplifier plate circuit to resonance.

BALANCE - This control is only effective with the meter switch in the LIN position. It is used to set the meter to zero for checking amplifier linearity.

INCREASE LOAD - This control provides a means for adjusting the amplifier output.

METER - The reading of the meter is in accordance with the settings of this control as follows:

PL MA - indicates the plate current drawn by the tubes.

PL HV - indicates the plate voltage.

Note: Plate voltage times plate current in amperes (500 ma = 0.5 amperes) equals DC plate power input. The relationship between the SSB suppressed carrier peak power and CW or single tone operation is roughly two times. This applies to the condition where limiting or suppressing devices are not used in the circuitry of the audio or RF sections of the transmitter/exciter.

RF VOLTS - indicates relative output voltage appearing across the output terminal of the unit.

LIN - compares the change in input signal to the change in output signal for checking linearity of the amplifier. It does not check the linearity of the exciter unit, nor does it indicate flat-topping.

Tune-up-Procedure

(1) With the HXL-ONE Linear Amplifier power switch in the OFF position, tune the exciter unit to its normal power output.

CAUTION: A dummy load (such as the Heath Cantenna) should be used while tuning up any transmitter. This is especially true of a high power linear amplifier and is extremely important, particularly during the time when the operator is becomming familiar with the operation of the new piece of equipment. ALWAYS TUNE UP INTO A DUMMY ANTENNA SO AS TO MINIMIZE INTERFERENCE ON THE AIR.

(2) Turn down the RF drive control on the exciter unit.

Note: If the exciter has no RF drive control or the RF drive control is ineffective on SSB, reduce the audio input to the exciter.

(3) Set the BAND control for the desired band and the TUNE control in the approximate position for the band in use.

(4) Set the LOAD control at the fully clockwise direction (minimum loading).

(5) Push the HXL-ONE Switch to ON, and apply enough RF drive from the exciter so as to produce about 250 milliamperes of plate current (Meter switch must be in PL MA position). Quickly rotate the TUNE control for a dip in plate current.

(6) Bring the RF drive control of the exciter up to the normal level and check the TUNE control for maximum dip in plate current.

Note: The normal level of the drive control is that level which produces sufficient output to drive the linear amplifier at its rated power input. In most cases it will be necessary to operate with the drive control below maximum output of the exciter.

(7) Turn the HXL-ONE LOAD control in a counter-clockwise direction which will produce an increase in plate current. By continually readjusting the TUNE control for a dip in plate current as the load is increased, a position of the LOAD control should be found which produces maximum RF output. With sufficient drive the amplifier may be loaded to 500 milliamperes plate current for CW and SSB operation. For AM the loading should be 275 milliamperes. For RTTY the plate current should be 300 milliamperes.

Note: Always finish the tune-up process by checking for dip with TUNE control.

For best linearity the loading of the amplifier should be increased just beyond the point of mximum power output. Proper loading of the amplifier occurs when the power output drops approximately 5% from the maximum and when the loading is on the over coupled side.

(8) Set the meter for checking the linearity of the amplifier by turning the meter switch to the LIN position. With the HXL-ONE operating in the SW mode, adjust the BALANCE control for a "0" meter reading. Under single sideband operation, the movement of the meter should remain virtually constant during modulation. Any appreciable downward deflection indicates non-linear operation and should be avoided.

THEORY OF OPERATION

General

The HXL-ONE operates as a grounded grid, Class B RF linear amplifier. In addition to the RF and meter circuitry, the power supply and an antenna changeover relay are included within a single enclosure. A schematic diagram of the amplifier is included at the rear of this manual and should be referred to in connection with the following description.

Input Circuit

A broadband input circuit which includes a tapped ~~bifilar wound~~ coil L112 ~~input coil L105A,~~ * couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the BAND switch S102. It automatically selects the proper tap on ~~L105A~~ L112 to which the input is connected for best drive efficiency.

A sampling circuit consisting of R104, R105, C115 and CR #102 supplies a DC voltage, proportional to the applied RF from the exciter, to the metering circuit. The DC thus obtained in used to check the linearity of the amplifier as is explained in a subsequent paragraph.

Bias Circuit

The bias circuit, CR #103 and C #118 performs two functions. First, it is a source of voltage employed to operate the antenna transfer relay K101, and second, it supplies a small negative DC voltage to the grids of the 572A/B tubes during standby. Although the tubes are high mu zero bias triodes, the application of a small bias reduces the standby plate current to a very low value and eliminates the "shot noise" generated by the electron flow of the amplifier from getting into the associated receiver.

Output Circuit

The plate or output circuit is tuned by a Pi network consisting of C106, L103, L104 and C109. In addition C107 and C108 are automatically switched in on the lower frequency bands. Variable capacitor C106 resonates the plate tank circuit and is adjusted by operating the TUNE control on the front panel. The three-gang capacitor C109 is varied by operating the LOAD control. Its function is to attain a match between the output of the amplifier and the impedance presented by the antenna load and its feed system. To attain the best efficiency of operation, the VSWR of the antenna system should be no greater than 2:1.

A sampling circuit R107, R108, C110, CR101 and R109 assicoated with the amplifier output has two functions. When the meter switch is in the RF VOLTS position, a portion of the RF at the output termination is rectified and indicates the RF voltage at the output of the amplifier. The voltage as indicated, however, is only approximate to within 20% and will vary with frequency. If the impedance at this point is known the power output may be calculated roughly by using the formula E^2/R where E is the indicated voltage and R is the impedance.

Linearity Circuit

The second function of the output sampling circuit is to check the linearity of the amplifier. It is not designed to replace the more elaborate and preferred means of checking linearity with an oscilloscope or similar type modulation checker which employs oscilloscope techniques. An instrument such as the Heath Monitor Scope is highly recommended as a permanent station accessory.

With the meter switch in the LIN position, the voltage from the input circuit is balanced by an equal voltage from the output circuit. A balance between the two is attained by means of variable resistor R121 marked BALANCE. As long as the ratio of the two voltages remains constant the meter indication will be zero. However, if by increasing the input power there is no longer an increase of output power the meter will be caused to swing away from zero, indicating that saturation has been reached. During modulation a slight wiggle of the meter may be noted. This is normal and is due to a slight non-linearity of the tube characteristics. Violent swings of the meter should be avoided. It must be pointed out that the linearity circuit will not indicate flat-topping of the exciter.

Antenna Relay

The double pole-double throw antenna relay is wired to permit the antenna to bypass the amplifier during periods that the amplifier is OFF or during periods that the relay is not actuated by an external device.

Power Supply

Both the filament and plate transformers have dual primaries which are connected in parallel for 115 Volt operation and in series for 230 Volt operation. The plate supply employs a voltage doubler circuit in which CR104 thru CR109 are silicon rectifiers and C123 thru C128 are the filter capacitors. To eliminate the current drawn by the bleeder from the metering circuit, the bleeder resistor R119 is not directly connected to ground.

The plate milliamperes drawn by the tubes is a function of the current thru a one ohm resistor R118. When the tubes draw 500 milliamperes, 1/2 volt appears across the resistor and the meter multiplier resistor R120 in conjunction with internal resistance of the meter acts as a voltmeter but is calibrated in milliamperes.

* as per addendum No. 9010-15-00001.

MAINTENANCE

General

The HXL-ONE Linear Amplifier is designed to give years of trouble free service. Under normal conditions, it requires little attention. Because the equipment is ventilated by a fan, dust may accumulate on the switches and other components within the enclosure. It is suggested, therefore, that the unit be removed from the cabinet and cleaned approximately every six months or oftener if it is located in a dusty area. The preferred method of cleaning is to use a vacuum cleaner while dusting with a clean brush.

While the unit is out of the cabinet, inspect the relay contacts for burning or pitting. To clean the contacts, use a burnishing tool or the finest grit sandpaper. Do not use emery cloth or "crocus" cloth. After burnishing or sandpapering, clean thoroughly with alcohol, carbon tetrachloride or other cleaning agent.

Twice a year, a drop or two of light oil should be applied to the bearings of the fan motor.

Neutralizing

To check neutralization, tune up the amplifier on the 10 meter band with the amplifier connected to a dummy load such as the Heath Cantenna to which a VTVM can be attached. Turn the TUNE control back and forth through resonance and note that the maximum output power occurs at the plate current dip. If necessary readjust the neutralizing capacitor C105.

BEFORE MAKING ADJUSTMENTS OF THE NEUTRALIZING CAPACITOR TURN OFF THE POWER TO THE AMPLIFIER.

RF Output Metering Circuit Adjustment

Capacitor C110 in the RF output metering circuit is used to equalize the meter readings over a relatively wide frequency range. This adjustment is normally set at the factory, however, if it is suspected that re-adjustment is required it will be necessary to temporarily make use of a calibrated RF wattmeter. To reset C110 load the transmitter and linear amplifier into a dummy load whose calibration is relatively flat over the frequency ranges concerned. Load the amplifier for an output wattmeter reading of 400 watts in the 80 meter band. Note the meter reading with the meter selector switch in the RF Volts position. Next tune to 20 meters and reload the amplifier for 400 watts. Note the meter reading (RF VOLTS) again. Re-adjust C110 if necessary to produce the same meter reading as when the amplifier was tuned up on the 80 meter band. On the basis of a pure 50 ohm load, the voltmeter should indicate 141 volts.

Note: It is extremely important that the amplifier be loaded to the same RF power output into the dummy load in all of these tests.

Now return to the 80 meter band and notice the meter reading. If it is within 10% of the 20 meter reading make no further adjustments. If in excess of 10%, re-adjust C110 and then recheck on the 20 meter band. After two or three cycles of rechecking a setting of C110 should be found which produces the desired condition.

Bandswitch Selector

Should the cord operating the band switch selector require replacement refer to Figure 3 which shows the details of this operation.

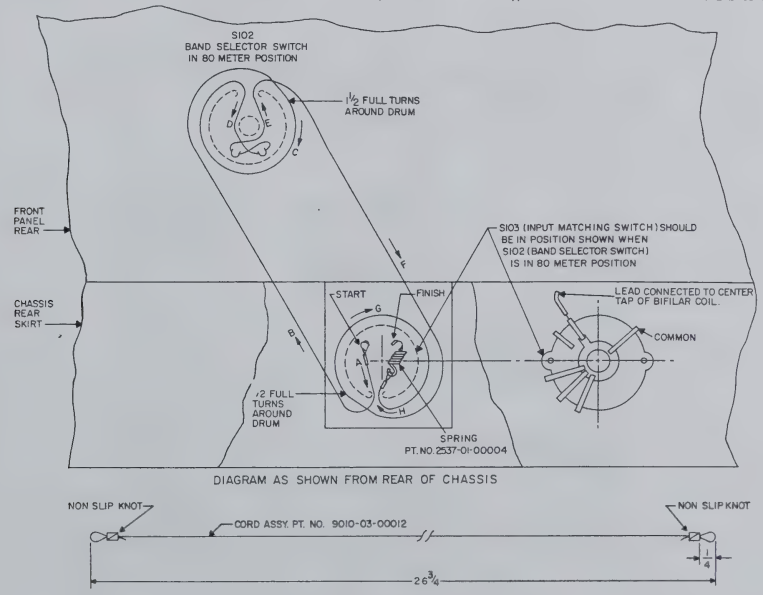


FIGURE 3

BAND SELECTOR & INPUT MATCHING SWITCH DRIVE ASSY.

Trouble Shooting

Most troubles, should they occur, can be readily located by the average amateur radio operator. Refer to the schematic drawing in the back of the manual and Figures 4 and 5 which are top and bottom views of the chassis and indicate the location of the principal components. A parts list is contained in Section 7. This gives component values and Hammarlund part numbers. Should difficulty be experienced with the equipment please write the Hammarlund Manufacturing Company for advice or to arrange for factory service.

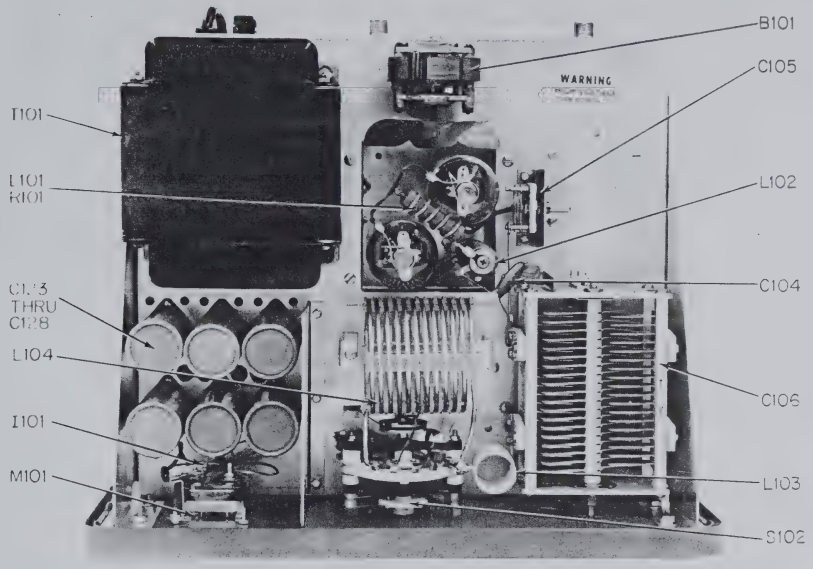


Fig. 4 – Top View of Chassis

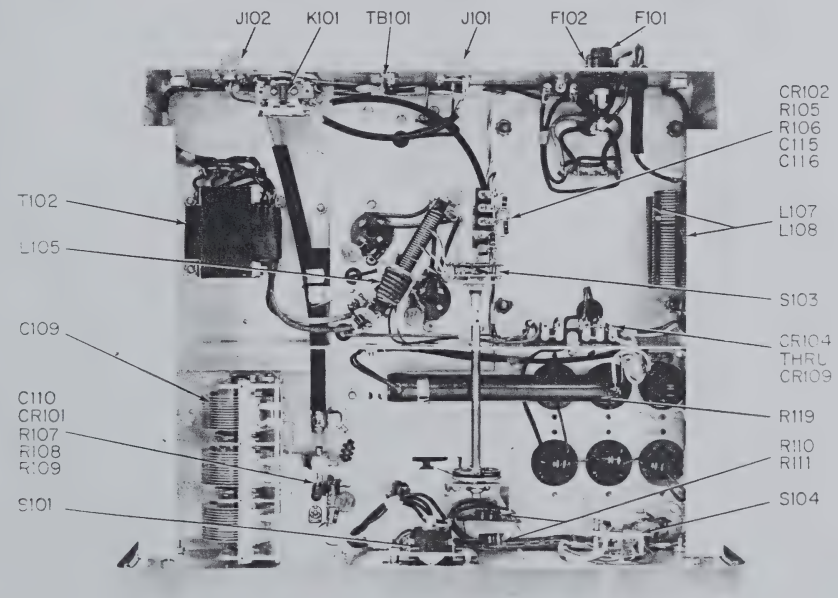


Fig. 5 – Bottom View of Chassis

SOME USEFUL NOTES & HINTS

The article entitled "How To Run Your Linear" which appeared in QST for November 1962, should be referred to for background and theory of operation of linear amplifiers.

220 Volt operation is recommended for best performance, particularly at the maximum plate power inputs, as the reduced primary amperage results in lower voltage drops in house wiring, thereby providing improved regulation of the high voltage circuitry.

It may be necessary to slightly re-tune the exciter for maximum drive to the amplifier on the various bands. When switching to straight through reduced power operation, the exciter unit should normally not require any re-tuning.

When modulating the HXL-ONE in SSB service, the plate current swing should be between 300 and 400 milliamperes on voice peaks.

On the 10 and 15 meter bands, minimum loading may not occur at the fully clockwise position of the loading control. The correct setting is counter-clockwise from that position which produces minimum loading.

Do not decrease the loading of the amplifier to reduce plate power input. The amplifier must be loaded for maximum input consistent with maximum output. The drive of the exciter should be reduced if less plate power input to the amplifier is desired. This will assure maximum linearity.

While the loading and tuning adjustments may be used to reduce a small impedance difference between the amplifier and the antenna system, it is highly desirably to have the standing wave ratio of the antenna system as low as possible to provide best performance. With an appreciable SWR the tuning indications will vary widely from those marked on the front panel.

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	MOTOR	
B101	Motor, 115 V-60 Cycles, AC	3510-02-00002
	CAPACITORS	
C101, C102, C113	Fixed, Ceramic disk, .005 mfd ± 20%, 500 V	1509-01-01020
C103, C104	Fixed, Ceramic disk, .0022 mfd, ± 20%, 6000V	1509-02-01034
C105	Variable, Neutralizing, 2-10 mmf	9411-03-31108
C106	Variable, Tuning Included in L103	9412-90-11030
C107, C108	Fixed, Mica, 820 mmf ± 10%, 500V	1519-02-02002
C109	Variable, Loading	9010-03-00005
C110	Trimmer, N750, 8-50 mmf, 350V	1513-01-00002
C111, C112, C116, C117, C119, C120, C121, C122	Fixed Ceramic disk, .01 mfd GMV, 500V	1509-02-01033
C114	Fixed Ceramic disk, .1 mfd +80-20%, 100V	1509-01-01018
C115	Fixed, Dur Mica DM-15 4 mmf ± 5 mmf 500V	1519-02-00025
C118	Electrolytic 250 mfd 25V	1515-02-01008
C123, C124, C125, C126, C127, C128	Electrolytic 100 mfd 450V	1515-01-00001
* C 129	DISC-CERAMIC, .1 MFD +80-20%	1509-01-01018
* C 130	DUR~~A~~-MICA DM-15 500V 1pF ±.5pf	1519-01-00023
	DIODES	
CR101, CR102	Germanium Diode 1N34A (RF Indicator)	4823-02-00001
CR103	Silicon Diode CER69A (Bias & Relay)	4804-02-00002
CR104, CR105, CR106, CR107, CR108, CR109	Silicon Diode CER73 (High Voltage)	4808-02-00002

* SEE PAGE 14 FOR ADDITIONAL CAPACITORS

* as per addendum No. 9010-15-00001

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	FUSES	
F101	Fuse, ABC, 15 Amp. for 115V operation (plate)	5134-02-00206
F102	Fuse, SLO-BLO, 3AG, 1 Amp. for 115 V operation	5134-02-00002
F101	Fuse, ABC, 6 Amp. for 230V operation (plate)	5134-02-00207
F102	Fuse, SLO-BLO, 3AG, 1/2 Amp. for 115V operation	5134-02-00006
	LAMP	
I 101	Lamp Incandescent #47	3901-01-00001
	CONNECTORS	
J101	Connector, RF Input Receptacle	2111-01-00001
J102	Connector, RF Output Receptacle	2111-01-00001
	RELAY	
K101	Relay, Antenna	4531-02-00001
	COILS	
* ~~L101~~	~~Parasitic RF Inductor Assembly (with plate caps)~~	~~9010-03-00011~~
L102	RF Choke, 96 Millihenries	1804-02-00053
L103	Inductance Coil, Included in C106	See C106
L104	Inductor, PA Plate Tank	1805-02-00060
L105	Coil Assembly. Includes L105A and L105B	9010-03-00002
L105A	Coil, Bifilar Included in L105	See L105
L105B	Coil, Neutralizing Included in L105	See L105
L107	RF Choke	1805-02-00120
L108	RF Choke	1805-02-00120
L109	RF Choke, 2.5 Millihenries	1802-01-00001
* L110 - L111	CHOKE, PARASITIC	1806-02-00040
* L112	INPUT, MATCHING	1804-02-00061.

* as per addendum No. 9010-15-00001

7. PARTS LIST - HXL-ONE

SCHEMATIC DESIGNATION	DESCRIPTION	HAMMARLUND PART NO.
	METER	
M101	Meter (Special)	2902-02-00001
	RESISTORS	
~~R101~~	~~5 ohms, 10W., ± 10%~~	~~See L101~~
R102, R103	47 ohms, 1W., ± 10%	4704-01-00616
R104	10K, 1/2W., ± 10%	4703-01-00344
R105	18K, 1/2W., ± 10%	4703-01-00335
R106	15K, 1/2W., ± 10%	4703-01-00346
R107	22K, 2W., ± 10%	4705-01-00948
R108	820 ohms, 1/2W., ± 10%	4703-01-00331
R109	10K, 1/2W., ± 10%	4703-01-00344
R110, R111	1.3 megohms, 2W., ± 5%	4705-02-01122
R112, R113, R114, R115, R116, R117	470K, 1W., ± 10%	4704-01-00664
R118	1 ohm, 5W., ± 10%	4713-01-00002
R119	75K, 100W., Wirewound	4715-02-00101
R120	820 ohm, 1/2W., ± 5%	4703-02-00445
R121	Variable, 10K, ± 30%, Balance	4735-02-01013
* R-122-123-124-125	470 Ω ± 10% 2W	4705-01-00928
	SWITCHES	
S101	Switch, Power	5111-02-00001
S102	Switch, 5 Pos., Band Selector	5106-02-00004
S103	Switch, RF Input Matching	~~5106-02-00002~~ * 5106-02-00021
S104	Switch, 4 Pos., Meter Function	5107-02-00005
	TRANSFORMERS	
T101	Power Transformer	5601-02-00001
T103	Filament Transformer	5602-02-00001
	VACUUM TUBES	
V101, V102	Electron, 572A/B	5731-02-00001

* as per addendum No. 9010-15-0001

MISCELLANEOUS PARTS

DESCRIPTION	PART NO.
Fan	2604-02-00002
Knob 2" Diameter (Tune & Band)	2430-02-00087
Knob 3/4" Diameter (Balance)	2430-01-00082
Knob 1-1/2" Diameter (Meter & Load)	2430-02-00085
Spring (String Drive, Band Selector)	2537-01-00004
Band Selector Drive Cord Assembly	9010-03-00012
Mounting Screws, Steel (Cabinet to Chassis)	2838-54-10120
Washer, flat steel (Cabinet to Chassis)	2898-64-11005
Fuse Holder and Cap	5136-01-00001
Instruction Book	52791-1
CLip, TUBE	2117-02-0002

* CAPACITORS:

C 131	DUR-MICA	DM-15,	33 Pf. ± 2%	500V	1519-01-00086
C 132	" "	" ,	62pf ± 2%	"	1519-01-00056
C 133	" "	" ,	220pF ± 5%	300V	1519-01-00007
C 134	" "	DM-19,	510 pf ± 5%	500V	1519-01-03002

Change or additions as per addendum No. 9010-15-0001

Instructions for re-installing X-former of HXL-1

Ike.

Replace the transformer as per attached label on rear of transformer. The bolts-nuts are taped to the chassis in an orange sack. The 4 lead cluster goes through the rearward grommeted hole for attachment to the 4 lug terminal strip numbered 1-4 and colored discription of each lead as per label.

After installing transformer - place chassis on its left side as viewed from the front. (So all the weight is low on the table) the 4 lug term. strip is then number 1-4 from the Top down and the ~~the~~ color code on each lead starts as No 1. = Black-Red Stripe No 2 = Black with green stripe, No 3 Black with yellow stripe + No 4 - Pure Black.

Also - No 1 lug has a black + brown lead so at present there'll now be 3 leads on lug No 1.

No 2 lug has a black additional lead - now there be 2 leads on it

No 3 lead has a brown lead also - total 2 on it.

+ No 4 lug has 2 extra black leads which total 3 on it when transformer lead is on. It is at other terminal strip that you'll change the wiring for 220/250 Volts. As wired for 110V now.

The 2 red leads with heavy insulation run through the front most grommeted hole.

The long lead - 6" long - goes through fiber bolt X and connects to upper rt. capacitor lug with the symbol ⏀ on it. For that lug we also tie 1W 470K resistor and a black lead. This lug has 3 leads on it. (I used a short piece of dummy hook-up wire to tie proper lug so you'll have no doubts and to see the routing

(over)

The short red lead (2" long) goes to the nearest terminal strip. Label numbered from bottom — [illegible] upward - it's labeled. The short red lead goes to lug no. 3. This lug also has a bare wire on it and a diode lead. Now there'll be 3 leads on No 3 when the short lead goes on it. I used a heat sink on the diode lead when I resoldered it. (I further identified the correct lug for the shortened transformer lead by twisting a piece of red hook-up wire on it).

So that's it Geo. You shouldn't have any problem. Hopefully, [illegible] to a good [illegible].

The transformer is all wrapped and will be packed in a well padded apple box.

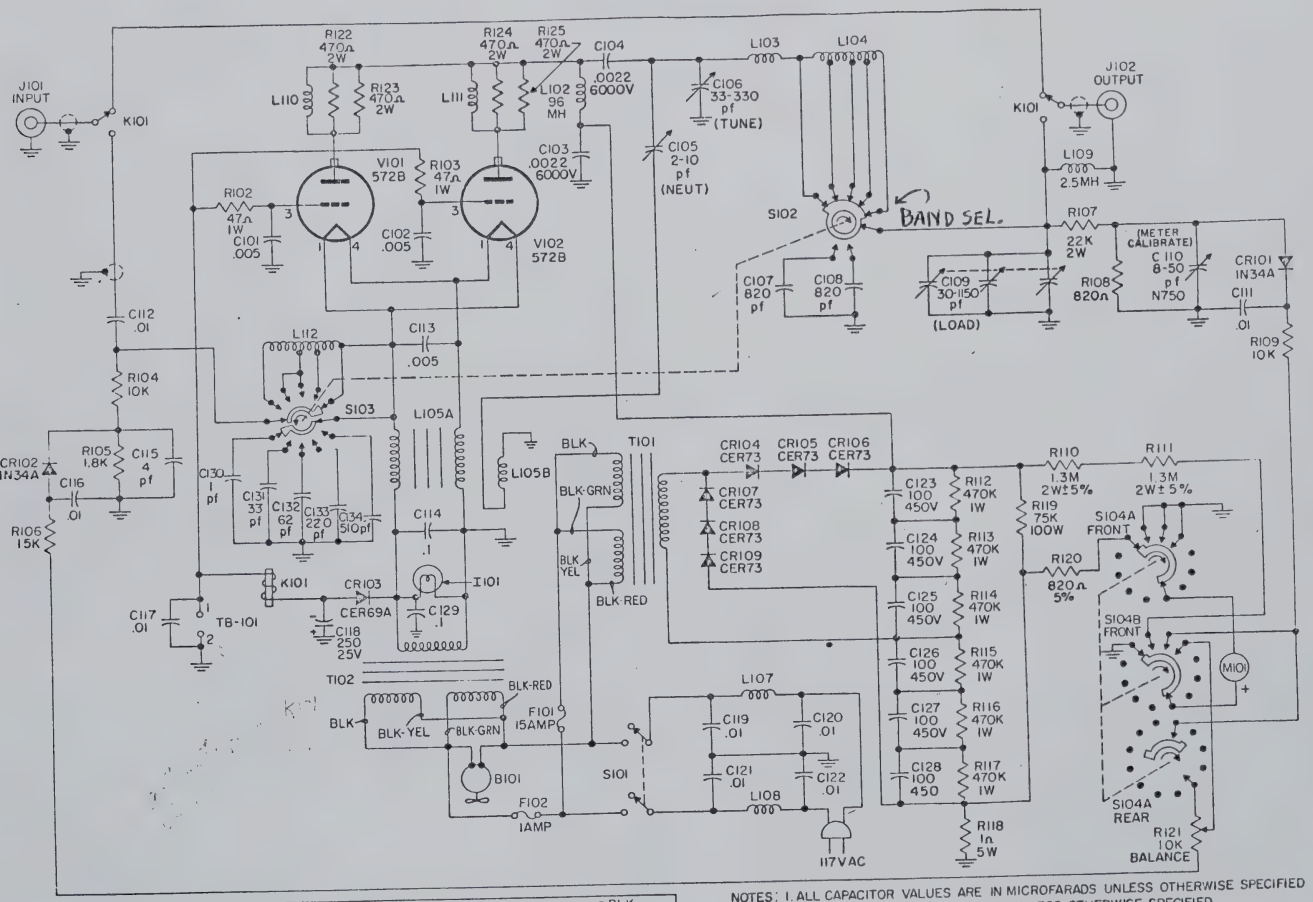
None of any of the adjustable [illegible] have been tampered with. You'll have a fine unit & your ability(?) [illegible] remove the transformer was a good one.

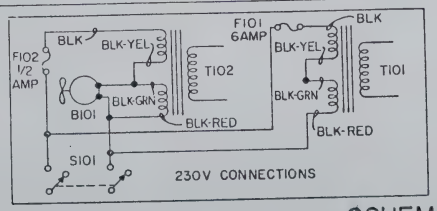
Best of Hamming Geo.

Sincerely

Ron [illegible]

P.S. So it might be also a good idea Geo to further satisfy yourself by checking the schematic.





NOTES: 1. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS ARE ½W ±10% UNLESS OTHERWISE SPECIFIED.
3. S102 & S103 SHOWN IN 10M POSITION.
4. S104 1 - PL MA
2 - PL HV
3 - RF VOLTS
4 - LINEARITY
5. S104 SHOWN IN PL MA POSITION
6. WHEN 230V CONNECTION IS USED, CHASSIS SHALL BE CONNECTED TO POWER GROUND.

SCHEMATIC DIAGRAM

LINEAR AMPLIFIER (HXL-ONE)

ADDENDUM
TO
TECHNICAL DESCRIPTION AND OPERATING INSTRUCTION MANUAL NUMBER 52791-1
HXL-ONE LINEAR AMPLIFIER

THEORY OF OPERATION

Page 7 (Input Circuit)

Change 1st paragraph to read as follows:

A broadband input circuit which includes a tapped coil L112, couples the RF drive from an exciter to the cathodes of the amplifier tubes V101 and V102. This circuit is connected through switch S103 which is mechanically coupled to the band switch S102. It automatically selects the proper tap on L112 to which the input is connected for best drive efficiency.

CHANGES TO PARTS LIST

Page 11		Hammarlund Part No.
1.	Add capacitor C129 Disc-ceramic, .1 mfd +80-20%	1509-01-01018
2.	Add capacitor C130 Dur-mica DM-15, 1 pf ±.5 pf, 500V	1519-01-00023
3.	Add capacitor C131 Dur-mica DM-15, 33 pf ±2%, 500V	1519-01-00086
4.	Add capacitor C132 Dur-mica DM-15, 62 pf ±2%, 500V	1519-01-00056
5.	Add capacitor C133 Dur-mica DM-15, 220 pf ±5%, 300V	1519-01-00007
6.	Add capacitor C134 Dur-mica DM-19, 510 pf ±5%, 500V	1519-01-03002

Page 12		
1.	Delete coil L101 Parasitic RF Inductor Assembly (with plate caps)	9010-03-00011
2.	Add coil L110, Choke Parasitic	1806-02-00040
3.	Add coil L111, Choke Parasitic	1806-02-00040
4.	Add coil L112, Input Matching	1804-02-00061

Page 13		
1.	Delete resistor R101, 5 Ω, ±10%, 10W.	
2.	Add resistor R122 470 Ω ±10%, 2W.	4705-01-00928
3.	Add resistor R123 470 Ω ±10%, 2W.	4705-01-00928
4.	Add resistor R124 470 Ω ±10%, 2W.	4705-01-00928
5.	Add resistor R125 470 Ω ±10%, 2W.	4705-01-00928
6.	Change switch S103 from 5106-02-00002 to ----------	5106-02-00021

Page 14		
1.	Add Clip, Tube cap	2117-02-00002

NOTE: Disregard Schematic Diagram in present manual, use new Schematic furnished with this Addendum.

Addendum No. 9010-15-00001

ESTABLISHED 1910